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THE PRACTITIONER.

JANUARY, 1909.

THE COMPLICATIONS OF SCARLET FEVER.

By WILLIAM HUNTER, M.D., F.R.C.P., F.R.S.ED.,

Physician to the London Fever Hospital, and to Charing Cross Hospital.

SCARLET FEVER is a disease, of which dread is very widely entertained, and for the victims of which isolation on an extensive scale is provided by local sanitary authorities. Measles, on the other hand, is a disease concerning which the public entertain comparatively slight antipathy, and for the isolation of whose cases no similar provision is made. Nevertheless, the mortality from the latter in the earlier years of life is very high; reaching sometimes as high as 40 to 50 per cent. between the ages of six months and two years, and falling rapidly after the fourth year. In scarlet fever, on the other hand, the mortality at the corresponding age—up to five years—is only about 16 per cent. The average mortality for all ages is about 3 per cent. (as compared with diphtheria about 9 per cent. and enteric fever 16 per cent.).

The greater importance attached to scarlet fever as compared with measles is, therefore, not to be explained by its severity or mortality *as now seen*. Among the better classes, the mortality is much lower than in hospital practice. There are, doubtless, many doctors, who have treated hundreds of cases in the course of their experience, and who have never had a death. Even in hospital practice, where the patients are drawn from a more limited and better class of patients—as is the case in the London Fever Hospital—the mortality is even lower than the 3 per cent. mentioned above. In the group of cases, 648 in number, under my care during the past four years, the mortality was 1.08 per cent. The statistics of the London Fever Hospital, for the past 60 years, which I have prepared, show, however, that the mortality in certain years has been as high as 20 per cent., the highest for any quinquennial period, since 1845, being in 1860-4, viz., 14 per

cent. It began to fall from that period, as will be seen below :—

Total Number of Cases.	Quinquennial Period.	Mortality.
800 - - - -	1860-1864	14.2
1,750 - - - -	1865-1869	10.9
1,500 - - - -	1870-1874	9.3
2,350 - - - -	1875-1879	8.3
3,000 - - - -	1880-1884	5.7
2,150 - - - -	1885-1889	2.1
2,400 - - - -	1890-1894	1.9
2,450 - - - -	1895-1899	1.7
1,600 - - - -	1900-1904	1.0

The lower mortality from 1870 onwards is due to the fact that, in 1870, the Board's hospitals were instituted under the Public Health Act, and the pauper patients, previously admitted into the London Fever Hospital, were transferred from it to these hospitals. The sudden drop from 5.7 to 2.1 was due to the fact that, in 1886, the notification of fever cases was made compulsory ; and that, from that time onward, a larger number of milder cases have been received into Fever Hospitals.

COMPLICATIONS OF SCARLET FEVER.

The facts mentioned above indicate that the mere mortality of this disease is not great, and does not justify either the public fear of it, or the public expenditure upon it. Nevertheless both these are fully justified on other grounds. For although its mortality may be but slight, and its course in most cases be uneventful, scarlet fever is a variable and treacherous disease. And it owes these features to the characters of the complications, to which in an unusual degree it is subject, from first to last.

These may be divided into two groups :—

- (1) Those connected with the scarlatinal infection itself ;
- (2) Those connected with the septic infection, with which it is so often associated, and by which, in an altogether special degree, it is so frequently aggravated.

The character of these complications may be gathered

from the subjoined table, embodying their incidence in a series of 648 cases under my care during the past four years 1904-7. I place them in the order in which I am accustomed to watch for them, and attach importance to them, viz.:—

GROUP 1.—*Local*: Secondary Angina, Secondary Adenitis, Cellulitis, Glandular Suppuration, Rhinitis, Otitis; and GROUP 2.—*General*: Albuminuria, Nephritis, Rheumatism.

The figures here given are based on a close analysis of the notes of these cases, made on a uniform system by myself. By the term “secondary,” applied to angina or adenitis, is meant any exacerbation of these conditions subsequent to the primary angina or adenitis which the patient presents in the initial stages of his disease. By “cellulitis” is meant the condition of adenitis, when the individual glands can no longer be felt, and are obscured by a general periadenitic swelling. By “albuminuria” is meant the presence of albumen unaccompanied by blood. By “nephritis” is meant the presence of albumen, with blood and blood casts.

By “rheumatism” is meant every degree of articular pain, however slight, and of however short duration. In by far the majority of cases—at least over 95 per cent.—these were only of slight and evanescent character. The rheumatism met with in scarlet fever, so far as my observation goes, is connected with the scarlatinal infection. It is extremely difficult to determine in what proportion of cases it causes actual endocarditis. The soft systolic murmur, which sometimes develops, generally disappears, and may be due to temporary dilatation rather than to actual endocarditis. I have only met with one fatal case of endocarditis in about 1,000 cases. It was sudden in onset, accompanied by early pericarditis. The child died in 4-5 days, and the mitral valve was covered with numerous soft vegetations.

Since the data for particular years afford points of interest, I give them for the four years. They bring out two facts of great practical importance:—viz., that while the *general complications*—albuminuria, nephritis, rheumatism, and relapses—have from year to year remained fairly uniform in their incidence, the *local complications*, which more than any other determine the severity of the disease, and are responsible for its chief fatal complication—such as septicæmia—have steadily

and uniformly diminished, as may be seen from the following figures :—

	Percentage.		Percentage.	
	from		to	
Secondary angina	15·7		11·8	
„ adenitis	36·1		20·9	
Cellulitis	5·2		0·4	
Suppuration	1·7		0	
Septicæmia and septic rashes	3·5		0	

TABLE I.—INCIDENCE OF COMPLICATIONS IN 648 CASES.

Year.	1904.	1905.	1906.	1907.	Total.
Number of cases - - - -	114	135	179	220	648
<i>Local Complications:—</i>	Percentage Incidence.				Average Total.
Secondary angina - - - -	15·7	14·8	5·5	11·8	10·1 ¹
„ adenitis - - - -	36·1	28·1	19·0	20·9	24·0 ¹
Cellulitis - - - -	5·2	4·4	2·7	0·4	2·7
Suppuration - - - -	1·7	0·8	0·5	0	0·7
Rhinitis - - - -	13·0	14·0	15·6	7·2	12·0
Otitis - - - -	10·5	11·1	14·0	7·7	10·6
Mastoiditis - - - -	0·8	0	1·1	0·9	0·7
<i>General Complications:—</i>					
Albuminuria - - - -	37·7	37·0	19·5	31·8	30·5 ¹
Nephritis - - - -	2·6	0·7	1·6	5·1	2·7
Rheumatism - - - -	22·8	23·7	18·4	20·0	20·8 ¹
Endocarditis and heart murmurs -	3·3	2·2	0·5	0·9	1·7
Septicæmia and septic rashes -	3·5	1·5	2·2	0	1·8
Relapse - - - -	5·1	2·2	5·0	1·8	3·55
No. of Deaths - - - -	- -	- -	- -	- -	Per cent. 1·08

The diminution is also shown, although to a less degree, in the incidence of *rhinitis* and *otitis*. Both these conditions,

¹ These percentages are to be considered in relation with the facts hereafter noted. They are not comparable with the percentages usually given for these conditions, *e.g.*, in the *Asylum Board Reports*. The incidence of “secondary adenitis”—*non-suppurative*—given in these *Reports* for 1902 is 7·58 per cent. and of *suppurative adenitis*, 1·65 per cent. for 1906, 5·81 and 1·77 per cent. respectively. That is to say, the degree of adenitis is such that about one in three to one in four suppurates. On the other hand, the degree included in my percentages is such that only one in twenty-one to thirty-four suppurates. What

however, and the *mastoiditis*, which complicates them, remain fairly uniform in their incidence. They are connected, in my judgment, with the virulence of the scarlatinal infection, and the existence of preceding unhealthy conditions (enlarged tonsils, adenoids) in the throat, and naso-pharynx.

They have, so far, proved less amenable to preventive measures of treatment than any other complications of the disease. This is particularly true of the otitis—an additional plea, if any further were wanted, in favour of dealing operatively with chronic tonsillitis and adenoids in all children who present these conditions.

The diminishing incidence of the first-mentioned conditions is of particular interest, since it is largely connected with the adoption of certain stringent measures of antisepsis, which I have been led, for the past five years, to adopt. It is necessary therefore to direct attention to these complications in greater detail.

SECONDARY ANGINA AND ADENITIS.

The first point I would note is that the percentages attached to the various conditions, indicate the existence of the complication, however slight in degree. I am accustomed to denote the degree by the figures 1°, 2°, 3°, indicating slight, moderate, and marked degrees respectively. The figure 1°, however, denotes a change so slight that it would not I term adenitis is thus seven to ten times slighter in degree than that connoted in the other statistics referred to. These latter are now nearly approximated by the figures given in Table II. for what I term 3° ("marked") of angina and adenitis respectively. Even in this degree, only one in five to seven cases suppurates.

The observations, described in the last-mentioned paper, were made on a series of 140 cases, noted in 1903, prior to the adoption of the stricter local "oral" antiseptic measures above described. They showed that there was a close relation between the degree of "oral sepsis" and the severity of the initial angina. When no oral sepsis was present, or that was only slight or moderate in degree, only 33 per cent. of cases had a moderate or severe angina. When oral sepsis was marked (3°), the percentage of moderate and severe angina rose to 80 per cent.

There was also found in this group of cases a definite, although less marked, relation between the incidence of secondary adenitis and the severity of the initial angina—and indirectly therefore with the degree of oral sepsis. An interesting feature of the later series of cases (1904-7) here dealt with is:—that if the oral sepsis is immediately dealt with at the outset of the disease, as has been my practice since 1903, no statistical relation appears to exist between the mere incidence of oral sepsis and the above local complications. But such a relation can still be constantly observed in the individual cases.

be regarded clinically as a complication—for example, the slightest degree of redness of the throat or tonsil, or the slightest perceptible enlargement of the lymphatic glands. Even 2° of my nomenclature only denotes a medium enlargement of glands, sufficient to permit the glands to be rolled about under the finger.

The percentage of cases, then (10·1 and 24 respectively), in which some degree of secondary change is noted at the throat, or in the glands, far exceeds the actual number of cases which are usually regarded as complications. Even that which I regard as marked (3°) does not necessarily give the patient any trouble. But it is important to note the earliest appearance of change in the throat, or in the glands. For it is at this period that measures should be taken to check its further progress. The particular symptom, to which I am accustomed to attach importance as an indication of fresh disturbance, is any rise of temperature, however slight in degree, above the normal, after the temperature has once fallen to the normal. Any such rise invariably indicates some fresh outbreak of the infective trouble,—either in the throat, or in the naso-pharynx, or in the adjacent glands, and, if any slight adenitis is observed apart from angina, the seat of the trouble is in the pharynx or naso-pharynx.

If the slighter and moderate degrees of angina and adenitis are excluded, and attention is confined to the more marked (3°) degrees of those conditions, the percentage incidence of these two complications in scarlet fever in the above series of cases, is the following :—

TABLE II.—PERCENTAGE INCIDENCE OF 3° OF LOCAL COMPLICATIONS OF THROAT AND GLANDS IN 643 CASES.

Year.	1904.	1905.	1906.	1907.	Total average.
Number of cases -	114	135	179	220	—
Secondary angina -	2·6	10·3	1·6	2·2	3·8
„ adenitis -	9·6	7·4	3·3	1·8	4·7
Cellulitis - - -	5·2	4·4	2·7	0·4	2·01
Suppuration - -	1·7	0·8	0·5	0	0·7

This table brings out, even more clearly than Table 1, the extent to which these local complications can be controlled by treatment—if they are regarded, not as the natural consequence of the scarlatinal infection, but as the combined product of that infection, aggravated by pre-existing septic infection in the mouth, throat, and pharynx. My experience satisfies me that they are so to be regarded. And the striking diminution of *adenitis* from 9·6 per cent. in 1904 to 3·3 in 1906, and 1·8 in 1907; of *cellulitis* from 5·2 in 1904 to 2·8 in 1906, and to 0·4 in 1907; of *suppuration* from 1·7 in 1904, to 0·5 in 1906, and its absence in 1907, are, in my judgment, largely traceable to the increasing care taken to remove, so far as possible, *immediately on admission*, every trace of pre-existing septic infection—"oral sepsis" (staphylococcal and streptococcal) around the patient's gums and teeth, and *keeping it absent* by daily swabbings with 1 to 40 carbolic acid throughout the earlier course of the disease.

The degree to which such sepsis is met with varies. The following are the figures for the four years mentioned:—

INCIDENCE OF ORAL SEPSIS IN 648 CASES.

—	1904.	1905.	1906.	1907.
Oral sepsis - -	43 per cent.	26·6	26·3	25

The complications, here under consideration, do not depend solely on "oral sepsis"; all of them, especially the adenitis, are undoubtedly related to the virulence of the scarlatinal infection, and the individual resistance of the patient; and this latter is, in my judgment, largely determined by the pre-existence, or non-existence, of tonsillitic and naso-pharyngeal trouble. But, without doubt, the virulence of the scarlatinal infection is increased by the presence of ordinary staphylococcal and streptococcal infection, such as is invariably present with gingivitis, tartar deposits, and around carious roots. I have brought this fact out elsewhere, first of all in this Journal, 1900,¹ and later in relation to scarlet fever in the *Brit. Med. Jour.*, 1905.

¹ "Oral Sepsis as a Cause of Disease," THE PRACTITIONER, 1900. "Oral Sepsis in relation to Scarlet Fever," *Brit. Med. Journ.*, ii., 1905.

I here content myself with the statement that my further experience of individual cases, apart even from the strong support which these statistics yield, only serves to confirm the conclusions formerly expressed regarding the importance of removing, so far as possible by the simple local measures indicated above, this particular and accessible source of septic trouble.

The measures, necessary for its removal, are not those of antiseptic douches, and sprays, and mouth-washes, however often they may be applied, but are those mentioned above. The degree of importance which I attach to them may best be indicated by stating that I invariably carry them out myself; and my nurses are instructed to carry them out at the very outset on the admission of the patient.

ALBUMINURIA AND NEPHRITIS.

I pass now to the consideration of the group of complications, illustrating more remote effects of the scarlatinal poison. These include those mentioned above, connected with the kidney, and another group, the rheumatic, connected with the joints and the heart.

Although often placed in the forefront as among the most important complications of scarlet fever, this particular group causes me far less anxiety than the local group described above. One reason for this is, that the incidence of this complication appears to me to be much less under our control than the local ones referred to. It is the direct sequel of the scarlatinal infection, and this fact is brought out in an interesting way in Table I. It will be seen from this how uniform the incidence of albuminuria and nephritis is in the various years, irrespective of the variations in the local (scarlatinal and septic) features of the cases.

The second point is that albuminuria, in some degree, is a very common accompaniment of the scarlatinal infection, more common, it seems to me, than would appear from the statements generally made. The rule in the London Fever Hospital is that the urine of every patient is examined every second day throughout his stay in the hospital. The general belief is that the danger of kidney trouble is specially to be

eared about the second or third week. But the data, supplied by the group of cases here considered, show that albuminuria occurs in the first week of the disease in as many as 62 to 36 per cent. of cases; in the second week in 27 to 16 per cent. of cases; and the remainder in the third and fourth weeks. The incidence varies, however, in different groups of cases, and in different years, as the following tables show:—

(1) ALBUMINURIA.

TABLE III.—INCIDENCE OF ALBUMINURIA IN 534 CASES.

Year.	1905.	1906.	1907.	Average.
Number of cases - - -	135	179	220	—
Percentage - - - -	37	19·5	31·8	30·5 ¹
First week - - - -	36 per cent.		50 per cent.	43
Second week - - - -	16·6 per cent.		21 per cent.	18·8
Third week - - - -	13 per cent.		10 per cent.	11·5
Fourth week - - - -	9·5 per cent.		10 per cent.	9·7
After fourth week - - -	9·5 per cent.		8 per cent.	8·7
Occasionally - - - -	13 per cent.		—	—

Albuminuria is thus much more common in the early days of the disease than is generally supposed. But it is usually slight in degree, and short in duration. This is brought out by the following Table IV., showing the duration of the albuminuria:—

TABLE IV.—DURATION OF ALBUMINURIA IN 534 CASES.

Total Number of Cases—149.

Duration.

60	-	-	-	-	1-3 days.
29	-	-	-	-	4-6 "
20	-	-	-	-	7-9 "
7	-	-	-	-	10-12 "
7	-	-	-	-	13-15 "
5	-	-	-	-	16-18 "
4	-	-	-	-	19-21 "
7	-	-	-	-	22-48 "
10	-	-	-	-	Occasionally.

¹ The incidence here given is much higher than that given in the *Asylum Board Reports*. The percentages for 1902 and 1906 were 10·69 and 10·07

These facts emphasise the importance of daily observations on the urine throughout the course of disease.

In my earlier cases, I had the impression that albuminuria (with nephritis) was more likely to follow, when secondary adenitis occurred, than when it was absent. I have, therefore, made the following analysis of 788 cases :—

TABLE V.—RELATION OF SECONDARY ADENITIS TO ALBUMINURIA IN 788 CASES.

Year.	Number of Cases.	Secondary Adenitis.	With Albuminuria.	Without Albuminuria.
1903 - -	140	27	16	11
1904 - -	114	41	20	19
1905 - -	135	38	14	24
1906 - -	179	35	7	28
1907 - -	220	46	18	28
	788	187	75	110

It appears from this that there is no direct relation between the occurrence of the two conditions. The albuminuria is not merely a remote manifestation of a disturbance of which adenitis is the local result. The two conditions are not necessarily coincident, although they frequently are.

Both of them are undoubtedly the effect of the scarlatinal infection; but the albuminuria is the result of the *general* toxæmic process.

(2) NEPHRITIS.

This independence of the kidney complications is brought out in an even more striking way, when we come to consider the incidence of *nephritis* as distinct from albuminuria.

No sharp line of distinction can be drawn between an albuminuria of a severe degree and a nephritis. But for clinical purposes, the line I draw is the presence of blood; and the subsequent course of the two classes of case—albuminuria without blood, and nephritis with blood—justifies the distinction. respectively. On the other hand, the incidence of “nephritis” in my group of 648 cases (*see* Table VI.) is 2·7 per cent., as compared with 5·36 and 4·72 per cent. for the years 1902 and 1906 respectively, drawn from the far larger and severer group of cases included in the total of 22,718 cases of the Asylum Board Hospitals for these two years.

For it is among the latter, not the former, that really dangerous uræmic complications are to be found.

This nephritis is a very variable complication, both in degree and in frequency. It has occurred in 2·7 of my group of 648 cases; but the following shows its variability:—

TABLE VI.—INCIDENCE OF NEPHRITIS IN 648 CASES.

Year.					Number of Cases.	Nephritis.
1904	-	-	-	-	114	2·6 per cent.
1905	-	-	-	-	135	0·7 „
1906	-	-	-	-	179	1·6 „
1907	-	-	-	-	220	5·0 „
					648	2·7 per cent.

The days on which this nephritis developed in nine of the cases in which it was met with were:—

28, 19, 22, 31, 18, 32, 38, 18, 29,

viz., from 18th to 38th day—average 27th day—at the end of the 4th week.

The one feature about this nephritis, which has most impressed me, is its treacherous character. It is not the cases, with more or less albuminuria, which develop the nephritis. The following case illustrates this well, as also the sudden onset of this complication.

A healthy little boy, aged 13, admitted with a well-marked rash, a moderate degree of angina, hardly any adenitis, but with a sharp temperature averaging 102°, and lasting for five days. On the 3rd day, he had a slight trace of albumen, which lasted only one day. On the 18th day, he suddenly developed uræmia with convulsions (and suppression of urine), necessitating several administrations of chloroform. In 24 hours the flow of urine was slowly re-established; but it continued to show blood till the 56th day, and it contained a minute trace of albumen, when he left the hospital on the 91st day. This trace disappeared about two to three months later, and he has since remained quite well.

In this case, there was nothing to indicate, before the sudden onset of uræmic convulsions, that the kidney was the

seat of trouble ; and the only case of death from nephritis, which I have had in my series, was of a similarly sudden character.

The occurrence of these two cases, in close relation to each other, led me to devise a simple but most effective way of treating such cases, which is now in general use. This consists in covering the patient's body with an ordinary cradle, within which are suspended two electric lamps of 16-candle power and 8-candle power. The boy, just referred to, was kept in this continuously day and night for 5 to 6 weeks, till all trace of blood had disappeared, and only a trace of albumen remained. The uniform warm temperature, maintainable in this way, keeps up an insensible perspiration, which interferes in no way with the patient's comfort, and the temperature can be varied according to requirements by replacing the electric lamps with lower or higher candle power lights as required.

The complete recovery of the boy is ascribable, in a large measure, to the continuous treatment under which he was so long kept.

One other feature of the nephritis of scarlet fever calls for notice. This is its dependence upon other factors than those which determine the onset of the local complications.

It will be seen from Table VI. that the incidence of nephritis was greatest (*viz.*, 5 per cent.) in the group of cases of 1907 ; and yet, during this year, the incidence of the chief local complications was at its lowest. (See Table II.) The two factors, to which I have been led to attach chief importance in relation to nephritis are, (1) exposure to sudden variations in temperature as the chief one, and (2) allowing the patient to get up too soon. My rule now is to keep them in bed for three weeks, however mild the case.

I have dealt briefly with these two groups of complications, as illustrating the character of the local and general complications respectively.

Further consideration of the other individual complications will be furnished by the papers which follow this.



THE HEART IN SCARLET FEVER AND
DIPHTHERIA.

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ONE of the first enquiries usually made in investigating the history of a case of chronic valvular disease of the heart when it first comes under observation, is whether the patient has had acute rheumatism or scarlet fever, as these are the two chief recognised causes of endocarditis. We know that rheumatism is by far the most common cause, but it is often difficult to obtain a history of rheumatism, as the articular manifestations in the young are commonly very slight, and may be attributed to "growing pains," or some other equally vague affection, so that a doctor is not consulted, and the cardiac lesions consequently escape detection at the time of the attack. This can scarcely occur in scarlet fever, as, from the nature of the disease, the patient can rarely fail to come under medical observation. The incidence of endocarditis in scarlet fever, however, is apt to be overrated, and, when we come to inquire into statistics, it is remarkable in what a small percentage of cases it is found to occur as a complication.

In the report of the Metropolitan Asylums' Board for 1907, out of 22,096 cases of scarlet fever, endocarditis occurred as a complication in only 129, or in $\cdot 58$ per cent.

In the statistics of the London Fever Hospital for the last 5 years, the percentage of endocarditis, as a complication, works out at 1.8.

Pericarditis is a still less common complication, the percentage of incidence being, in the Asylums' Board cases $\cdot 08$, in those of the London Fever Hospital $\cdot 15$. Both endocarditis and pericarditis are most liable to occur in association with post-scarlatinal "rheumatism."

The presence of a systolic mitral murmur must not necessarily be taken as an indication of endocarditis. It is often met with, at some period of the disease, as a result

of temporary dilatation of the left ventricle due to myocarditis, or to renal complications.

McCollum states that, in an analysis made by him of 1,000 cases of scarlet fever, a mitral systolic murmur was detected in 187 cases, but endocarditis was present in 3 only, and pericarditis in 5.

The effects of the scarlet fever toxin on the myocardium are similar to those of rheumatism. In severe cases, there is interstitial inflammation with cellular exudation around the vessels; the muscle fibres lose their striation, and undergo granular and fatty degeneration. In milder cases, the changes are mainly limited to cloudy swelling of the muscle.

The most striking feature about the physical signs is the acceleration of the pulse.

This is out of all proportion to the severity of the fever, nor is it accounted for by dilatation of the heart, as it is often very marked both in mild cases, when there is no evidence of dilatation, and also, early in the course of the disease, at a period before the myocardium can have suffered to any extent from the scarlet fever toxin.

It frequently persists also during convalescence, long after the pyrexia and all other symptoms have subsided. This curious anomaly is usually most marked, and most frequently met with in children. The following charts of pulse rate and temperature, one from a child of 7, one other from a child, aged 6, recently under my care at the London Fever Hospital, well illustrate this. They were both mild cases of scarlet fever with no complications of any kind; yet it will be seen that the pulse rate, in the fourth week of the disease, when the temperature was normal (there was no albuminuria, and the patients seemed perfectly well), was as high as 130 or 140 for no apparent reason. The area of cardiac dulness was normal, there was no murmur, and the first sound was good in tone in both instances.

The tachycardia of scarlet fever cannot therefore be satisfactorily explained as being due to myocarditis, or cardiac dilatation, at any rate in a large proportion of cases. It seems to me that we must attribute it to some disturbance of the nervous mechanism of the heart, and it may possibly be that the scarlet fever toxin has a special affinity for the fibres of

14

Day of Disease	
Pulse	Temp
140	105°
130	104°
120	103°
110	102°
100	101°
90	100°
80	99°
70	98°
60	97°

Day of Disease	
Pulse	Temp
140	105°
130	104°
120	103°
110	102°
100	101°
90	100°
80	99°
70	98°
60	97°

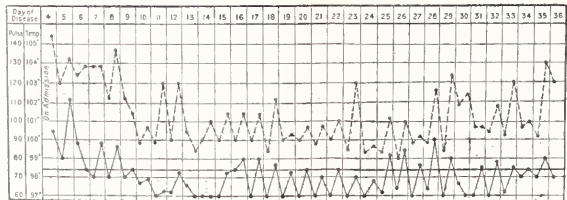
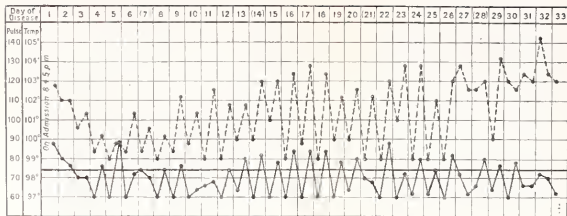


Fig. 1. — Pulse rate, indicates pulse rate, the lower, the temperature.

the vagus, possibly inducing a peripheral neuritis, or in some way interfering with its inhibitory mechanism.

Irregularity of pulse may sometimes occur during convalescence, often associated with increased frequency. The prognosis (apart from endocarditis or pericarditis), as regards cardiac complications, is usually favourable, and there is practically no risk of syncope or sudden death as in diphtheria. No special treatment is called for, as a rule, but in cases in which irregularity or rapid pulse permits during convalescence, care should be taken that the patient does not get up too soon, and that exercise at first should be strictly regulated.

THE CARDIAC COMPLICATIONS IN DIPHTHERIA.

One of the most serious dangers in diphtheria is that of sudden death from syncope or heart failure, which is liable to occur, not only early in the course of the disease, but even during convalescence when the patient appears to be making satisfactory progress. This naturally directed attention to the cardiac muscle, and numerous investigations have been carried out by various authors with a view to determining the reason for the especial liability to syncope in diphtheria, by Hayem, 1870, Rosenbach, 1877, Romberg, 1891, Ribbert, and others. The pathological changes found in the myocardium consisted mainly of granular and fatty degeneration with vacuolation of the muscle fibres. In 1897, Mollard and Regnaud undertook a series of exhaustive experiments at the Pasteur Institute, by inoculating dogs, rabbits, and guinea-pigs with the diphtheria toxin, with the object of determining its effects on the cardiac muscle.

They found that the heart muscle fibres were attacked in all cases, losing their striation, and undergoing granular, hyaline, and fatty degeneration, with marked vacuolation, being completely destroyed in some instances. The muscular coat of the blood vessels of the myocardium was also affected. The lesions were not universal but scattered, and, in the neighbourhood of the myocardial lesions, there were collections of leucocytes in the interstitial tissue, which they considered were called up for purposes of phagocytosis in order to remove the *débris* of the fibres which had been destroyed.

It is thus generally agreed that the heart muscle severely

suffers in diphtheria, and that the commonest changes are fatty, hyaline, and granular degeneration, but we meet with equally, or even more, severe myocardial lesions in other acute specific infections and toxæmias, without the same risk of cardiac syncopal attacks.

The condition of the cardiac muscle alone does not, therefore, appear to afford an adequate explanation.

The special affinity of the diphtheria toxin for the nervous system being well known, attention was next directed to the cardiac nerves. Degenerative changes in the pneumo-gastric nerve, indicative of severe neuritis, were found by J. Thomas,¹ in 1898, and have also been described by other writers. B. Meyers,² in a paper on Post-Diphtheritic Paralysis, in 1900, based on an analysis of 1,613 cases of diphtheria, attributed death in 64 cases to cardiac or vagus paralysis. Peripheral neuritis affecting the vagus would thus seem to account for the tendency to cardiac syncope in diphtheria. At first sight this might appear to be inconsistent with the myogenic doctrine that the heart is an independent, automatic, self-contained piece of mechanism.

We must, however, take into consideration the fact that the heart muscle is also damaged by the diphtheria toxin, and that, consequently, as is manifest also in other acute toxæmias, its tonicity and contractility are impaired, and there is a tendency to dilatation of the heart and acceleration of the pulse. When, as we may conclude is the case in severe diphtheria, in addition, the tonic and controlling influence of the vagus is cut off by neuritis, the heart may be compared with a runaway horse (as the "bruit de galop" often present might suggest), and a variety of disorders of rhythm may be expected to result. This indeed is what we find, as Tachycardia, Irregularity, Intermision, galloping rhythm, Bradycardia, and other disturbances are met with, which may lead up to the fatal issue.

SYMPTOMS AND PROGNOSIS.

The existence of some dilatation of the heart, or the presence of a systolic murmur, is not necessarily of serious

¹ *Med. and Surg. Reports*, Boston City Hospital, 1898.

² *Lancet*, 1900, Vol. II., p. 869.

import. Attention should be paid more especially to the character of the first sound, the interval between the sounds, and the rhythm. Tachycardia, approximation of the first and second sounds, spacing of the sounds, shortening and weakness of the first sound, and the "bruit de galop" are danger signals of the most grave order.

Irregularity of pulse and intermission are also of serious significance. Bradycardia is less common than tachycardia, and is usually not so serious; it may persist for some time after convalescence is established. Vomiting, in the later stages, is always a grave symptom, when attended with præcordial pain and distress, and may usher in the closing scene. Endocarditis and pericarditis are very rarely met with as complications of diphtheria.

TREATMENT.

The heart should be carefully examined daily in all cases of diphtheria, however mild they may appear to be, and a careful look-out kept for any of these danger signals. Prolonged and absolute rest in bed is essential when heart complications threaten, and on no account should the patient be allowed to sit up in bed. The diet should be carefully regulated, and small readily digestible meals should be given at from $2\frac{1}{2}$ to 3 hours interval, as there is danger in overloading the stomach of upward pressure on the heart, which may arrest a weakly acting right ventricle and prove fatal.

Brandy and strychnine, in suitable doses, the latter administered hypodermically, are the best cardiac stimulants to administer, but they should be kept in reserve, and not exhibited too early in the disease. Digitalis is of more doubtful service, and must be employed with great caution, as it is more likely to do harm than good in cases of severe myocardial degeneration.



THE RENAL COMPLICATIONS OF SCARLET
FEVER AND DIPHTHERIA.

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THE renal complications, which occur in connection with scarlet fever and diphtheria, are of considerable importance and interest. In scarlet fever they have both an immediate and a remote importance, since they may add very greatly to the immediate risks of the disease, and they may lay the foundations of a chronic malady, from which life may be threatened long after the occurrence of scarlet fever has been almost forgotten. The risks then of renal complications in scarlet fever are so grave that attention is necessarily diverted from the original illness, and concentrated upon the alleviation of the symptoms of more pressing urgency. The whole course of treatment will be directed to this complication, and every effort will be made to prevent an acute form of nephritis from gradually developing into a chronic tubal nephritis.

On the other hand, although renal complications occur in the course of diphtheria, it is only in some few cases that they produce symptoms which cause immediate anxiety. In the large majority, they possess very little importance so far as the immediate future is concerned. They are perhaps more frequent in cases of great severity, but in these the severity of the dangers incidental to diphtheria overshadows the importance of the renal complications. The renal changes may be an evidence of severe toxæmia, but, if death ensues, it will in general result from some cause wholly unconnected with the renal functions. With regard to the remote importance of the renal complications of diphtheria, it is comparatively rare for chronic renal changes later in life to be able to be traced definitely to an attack of diphtheria.

In scarlet fever, the range of the renal complications varies from a slight and transient albuminuria to an acute nephritis with severe symptoms of uræmia, or with more or less general dropsy. A transient form of albuminuria is sometimes noted

at the commencement of the fever, more particularly in those cases in which the temperature is abnormally high. This form of albuminuria is comparable with that found in many other diseases with high temperature, and has been designated "*febrile*." It usually disappears as the temperature falls, and is not associated with any special symptoms. Far more frequently the albuminuria of scarlet fever appears to be of toxic origin, and is discovered at a later stage than the foregoing. Repeated examinations of the urine will often disclose slight traces of albumin, when, to all outward appearance, the patients are making satisfactory convalescence with no noteworthy symptoms. These small traces generally yield to careful dieting and treatment, but there can be little doubt that, if neglected, this condition may form the starting point for an acute nephritis, with the well-known alterations in the urine, and the usual train of symptoms. Small traces of albumin, so often found during convalescence from scarlet fever, cannot be safely neglected, even though they may have been only disclosed by a daily routine examination of the urine. Such examinations should always be made, since it is not safe to assume that there is nothing wrong because there are no symptoms of trouble, and no visible alterations in the nature and amount of the urine. In all probability many of the severe cases of renal dropsy, seen amongst the out-patients at a children's hospital, might never have developed, had the occurrence of scarlet fever been recognised, and proper precautions been taken during convalescence. In a fairly large number of these cases, it is evident that the nature of the initial fever has been entirely overlooked, and a mild attack of scarlet fever has been regarded as a trivial "sore throat." These cases are happily becoming less frequent since greater care is taken with the notification of any case of infectious fever, but, in times of epidemics, complaints of sore throat must always be regarded with suspicion.

Many efforts have been made to determine the conditions under which there may be a special tendency to the development of renal complications. The slighter transient type of albuminuria has been found to be relatively more frequent in patients suffering from adenitis. There is good ground for believing that family predisposition to renal changes has some

influence, and that, in some epidemics, nephritis is relatively more frequent than in others. It is, however, somewhat uncertain whether atmospheric conditions do not play a more important part. Damp, cold, or muggy days have been found to favour the development of fresh cases of albuminuria amongst children convalescing in fever hospitals. The view, which perhaps is the most satisfactory, is that renal changes are due to irritation by some toxic material resulting from the growth of micro-organisms in the system, and that these changes may be almost quiescent, until, through exposure to cold or through climatic conditions, fresh congestion is excited. This theory serves to explain both the occurrence of albuminuria during the course of scarlet fever, and the readiness with which further development into an acute nephritis may follow upon some relatively slight exciting cause.

A curious feature, in connection with acute scarlatinal nephritis, is that it does not depend upon the severity of the original symptoms of the fever. In very many instances, it would appear to be more likely to arise after a mild initial fever, but, in all probability, this is only the result of the absence of any precautionary measures during convalescence from an undiagnosed malady. Another feature of considerable interest is the extreme rapidity which often characterises attacks of acute nephritis. Convulsive seizures of uræmic origin may be the first indications, or, in some instances, there may be sudden suppression of renal excretion followed quickly by the development of general œdema, and of an extreme degree of pallor. Under such conditions, although there may be much blood in the urine, there is good ground for believing that the change in the colour of the skin is due to œdema, rather than to the actual loss of blood.

The œdema of acute scarlatinal nephritis is generally of short duration under appropriate treatment, but unhappily, in some instances, it causes œdema of the glottis, which is a formidable and frequently fatal complication.

Many observers have noted the occasional appearance of œdema after scarlet fever, when no albumin can be found in the urine. Several examples came under my notice at the Evelina Hospital for Sick Children, and although there was no opportunity of examining the condition of the kidneys, as these

patients all recovered, the impression given was that the œdema was not merely the result of malnutrition, or of a profound anæmia.

Reference has already been made to the difference in the prognostic importance between the renal complications of scarlet fever and those of diphtheria. In the latter disease, albuminuria is relatively more frequent, but the albumin is usually found only in very small quantity. Its presence does not afford any indication of the severity of the disease, though the amount is often greatly increased when the diphtheritic symptoms are of an urgent type. Albuminuria in this disease does not appear to give rise to any distinct symptoms, nor to leave any permanent renal trouble after recovery from diphtheria. Although the albuminuria of diphtheria is therefore relatively unimportant, it must be remembered that occasionally complete suppression of urine occurs, and death is preceded by vomiting and heart failure. These symptoms might be regarded as uræmic, but there is no general œdema comparable with that of acute scarlatinal nephritis. It is true that, in severe cases of diphtheria, there is often pallor of the face, which resembles the waxy whiteness of the skin in acute nephritis with scarlet fever, but there is no œdema of the back, or of the lower extremities, as in the latter disease. It is quite possible that a toxic form of nephritis—a true diphtheritic nephritis—may eventually be recognised, as distinct from scarlatinal nephritis in many of its clinical features, but the practical result of my observation of this condition is that, unless it is the cause of sudden suppression of urine, it does not produce immediate or remote dangers, and does not call for any modification of the dietary or treatment.

The small traces of albumin of milder cases speedily disappear as convalescence progresses.

The larger quantities of albumin, which occur in severe cases, may be accompanied by slight hæmaturia, but do not ordinarily present symptoms of urgency comparable with those of diphtheritic toxæmia, or those of grave interference with the respiration, circulation, and nervous system. In other words, in severe cases of diphtheria, the albuminuria is merely one amongst many indications of the gravity of the prognosis, but it is not in itself a complication from which danger is to be anticipated.

OCULAR COMPLICATIONS OF SCARLET FEVER
AND DIPHTHERIA.

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THE OCULAR COMPLICATIONS OF SCARLET FEVER.

OCULAR complications are uncommon in scarlet fever. There is not infrequently some conjunctival irritation, but acute conjunctivitis is not an integral part of the clinical picture as in measles. When present it is probably due to the introduction of epithelial scales and débris into the eye from the lids. In rare cases, a pseudo-membranous or membranous conjunctivitis occurs (Debière, Uhthoff, Stöwer), due most commonly to streptococcic infection, less often to the diphtheria bacillus. Possibly, in the latter case, the xerosis bacillus has been mistaken for the Klebs-Löffler bacillus. Streptococcic conjunctivitis, when it occurs, is a serious complication, since corneal ulceration of a peculiarly virulent nature is liable to be set up, the cornea necrosing with extraordinary rapidity, the eye being inevitably lost. Few such cases are, however, on record after scarlet fever (*cf.* Kendall), though I have had experience of them after whooping-cough. Von Graefe pointed out long ago that keratomalacia sometimes occurs. Abscess (Jackson) and gangrene (St. Martin) of the lids have been reported, but these are seldom affected except by the œdema accompanying renal complications.

The most important ocular complications are secondary to scarlatinal nephritis. Of these uræmic amaurosis, as usual without ophthalmoscopic signs, is the commonest (Ebert, Reimer, Power, Loeb, Foerster, Barlow, Becher). Albuminuric retinitis is rare in all forms of acute nephritis, and the scarlatinal type is no exception (Hutchinson, Marchand). It may, however, result from the subsequent chronic nephritis (Aufrecht), but there is reason to believe that albuminuric retinitis in children is more often due to congenital syphilitic disease of the kidneys than to other causes (Nettleship).

Retinitis of the albuminuric type, but without albumin in the urine, has been reported by Vance. One case of embolism of the central artery of the retina has been recorded (Hodges). Optic neuritis is rare, only three cases occurring in a series of 253 patients with optic neuritis, due to various infectious diseases, collected by Uthoff. Groenouw collected five cases of scarlatinal optic neuritis, one with albuminuria (Barlow), three without albuminuria (Betke, Vance, Pflüger); meningitis may be present (Thomas). Orbital cellulitis has been observed (Gregory, Deval), and Nettleship attributed a case of unilateral optic atrophy to this cause. Strubell recorded periostitis, Kendall dacryocystitis, Linder dacryoadenitis, Lenhartz paralysis of extrinsic ocular muscles, but such complications must be regarded as rarities.

THE OCULAR COMPLICATIONS OF DIPHTHERIA.

Membranous conjunctivitis is the commonest form of eye disease due to the Klebs-Löffler bacillus, yet even this complaint is relatively infrequent in England, as was long ago pointed out by Soelberg, Wells, Hutchinson, Streatfeild, and Tweedy. The disease shows remarkable variations, indeed, in frequency in different places. Thus, it is much commoner in north Germany than in the southern and western provinces, and, as in England, it is rare in France, Switzerland, and Russia. Many other organisms, besides the diphtheria bacillus, may, in favourable circumstances, cause the formation of a membrane or so-called pseudo-membrane on the conjunctiva, and all such cases are liable to be mistaken for, or classified as, diphtheritic conjunctivitis. This error is the more probable, owing to the frequent presence of the xerosis bacillus in the conjunctival sac, a bacillus which is morphologically identical with the Klebs-Löffler bacillus, and is not with absolute certainty distinguishable from it even by cultural experiments. Series of cases of membranous conjunctivitis, which have been exhaustively investigated by inoculation experiments, carried out by competent bacteriologists, have shown conclusively that even the apparent severity of the conjunctivitis is little or no guide to the probability of the presence of the diphtheria bacillus. Hence statistics are likely to be peculiarly untrustworthy. Fortunately Neisser's method

of staining, though not impeccable, is fairly trustworthy as a means of distinguishing between the diphtheria and the xerosis bacilli, only, however, if it is carried out with minute attention to technical details.

The diphtheria bacillus is seldom found in pure culture in membranous conjunctivitis; staphylococci, streptococci, and other pathogenic organisms are usually present. It is doubtful, indeed, if the bacillus can attack the normal conjunctiva. Uhthoff regards previous conjunctivitis as essential in the human subject, a view which is supported by Axenfeld, who points out that virulent diphtheria bacilli have been found on the normal mucous membrane of the throat. They have also been found in the conjunctival sac (Coppez, Pichler). Mixed infection, *e.g.*, with streptococci, does not necessarily cause a severe type (Sourdille), though the majority of cases are worse than with pure diphtheria.

Apart from the presence of a membrane on the palpebral conjunctiva, the lids are brawny and oedematous. The lymph stasis in the conjunctiva is largely responsible for the extreme danger of corneal ulceration. It has been held that the diphtheria bacillus is able to attack the normal corneal epithelium, but the facts already adduced militate against this view.

Besides the local signs, the general condition is seriously affected. The body temperature is raised, and albumin is often present in the urine. The latter fact is of some diagnostic importance. Though the contagion is generally derived from cases of faucial diphtheria, it is astonishing how seldom the throat is affected. Extension from the throat is certainly rare, but it is said that extension to the throat is not uncommon (Blodig). My own experience does not confirm this view, possibly because the cases have been treated at an early stage. Serum treatment undoubtedly proved most efficacious, and, since it is wholly innocuous, should be adopted without delay in every doubtful case. I have been in the habit of ordering local instillation of the serum into the eye in addition to subcutaneous injection, for it is theoretically justified, and has appeared to be of practical service. Another curious fact is that conjunctival diphtheria is very rarely followed by post-diphtheritic paralysis.

Apart from severe corneal complications, which are very

likely to lead to loss of sight or complete loss of the eye, the cicatrization which follows the detachment of the membrane may cause symblepharon, entropion, trichiasis, and other complications. Gangrene of the lid has also been observed (Schillinger). Primary ulceration of the cornea is excessively rare; so much so that it is doubtful if it occurs. Diphtheria of the lacrymal sac may be due to extension from the nose (Landmann, Feilchenfeld), the commoner sequence, or from the conjunctival sac (Caspar): it may lead to destruction of the tear sac. Lindner describes dacryoadenitis as occurring in diphtheria, but it is more frequent in other infectious disorders. Orbital abscess, in the course of diphtheria of the conjunctiva (Rheindorf), is probably caused by a mixed infection with pyogenic organisms.

Optic neuritis is seldom caused by diphtheria; Uhthoff found it in six cases only out of 253 cases of optic neuritis occurring in the course of infectious diseases. Some authors, *e.g.*, Nagel, Schmidt-Rimpler, Bouchut, regard optic neuritis as a common complication, possibly mistaking the well-known pseudoneuritis for the pathological condition.

Post-diphtheritic paralyses, rare after conjunctival diphtheria, are frequent after diphtheria of the throat, and have been seen after affection of the vagina and wounds by the disease. The ciliary muscle is very often involved, the "amblyopia," due to this cause, having been first accurately explained by Donders. Paralysis of accommodation usually comes on three or four weeks after the commencement of the attack, though the time varies from a few days (Woodhead) to ten weeks. The onset is usually gradual, giving rise to increasing difficulty in reading. Both eyes are affected, almost always in equal degree. The patients are almost without exception children under 14 years of age (91 per cent., Remak); since they are generally hypermetropic the disturbance of vision is considerable, and may be quite apparent for distant objects. It is very exceptional for the iris to be affected, so that diagnosis is dependent upon subjective tests. These facts emphasise the importance of a proper routine in the examination of the vision of all patients. Thus, in children, it is imperative that not only the distant but also the near vision should be tested in all cases before the instillation of a mydriatic.

Paralysis of the accommodation by atropine is essential in the correction of refraction of nearly all children under 14 years of age. If the near vision has not been tested before the drug is used, it will be impossible to diagnose post-diphtheritic paralysis or paresis of accommodation.

Cycloplegia is, of course, not infrequently accompanied by paralysis of the palate—in 28 per cent. of cases, according to Remak—absence of knee jerks, paralysis of extrinsic ocular muscles, usually the external recti (11 per cent. of cases, Remak, Moll). Nerschel, Jessop, and König observed contraction of the field of vision, probably due merely to neurasthenia (König).

Paralysis of accommodation may be caused by ptomaine poisoning, mydriatics, etc., but is distinguished, in these cases, from the post-diphtheritic form not only in the absence of the characteristic history, but also in the fact that it is always accompanied by paralysis of the iris. As regards the history, there seems to be little or no relationship between the severity of the diphtheritic attack and that of the cycloplegia. The worst cases may follow a sore throat which has passed almost unnoticed, and has not been diagnosed as diphtheritic. The prognosis is good, recovery taking place usually in a few weeks, but varying from days to several months. Rare cases of death from paralysis of the respiratory muscles have been recorded.

It has already been mentioned that paralysis of extrinsic ocular muscles occurs sometimes after diphtheria, and that one or both external recti are most often affected. Characteristic features of such paralysees are their rapid onset, partial nature, and quick recovery; transient affection of different muscles in succession is also common. Complete paralysis of all the branches of the third nerve is very rare, having been reported only once (Parkinson). Paralysis of the superior oblique occurs occasionally. Ophthalmoplegia externa has been recorded several times, first by Uhthoff. It is found chiefly in children, eight to ten years old, coming on from two to six weeks after the onset of the primary disease. Both eyes are affected, though sometimes in unequal degree. Cycloplegia is rare in these cases, which thus differ from most of the other post-diphtheritic ocular paralysees.

THE EAR COMPLICATIONS OF SCARLET FEVER AND DIPHTHERIA.

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SCARLET FEVER, and, less prominently, diphtheria, are responsible for some of the most serious and fatal ear conditions met with—fatal to both life and hearing. They, therefore, are worthy of the attention of specialist and general practitioner alike. To the former they are full of interest from the rapidity with which they may destroy the organ of hearing, whilst, upon the latter, who more frequently sees their beginnings, they throw a heavy responsibility, because it may lie in his power to prevent their occurrence, or to at least render them less harmful by prompt measures of treatment.

The frequency of aural complications in diphtheria and scarlet fever is best shown by statistics. In the Annual Report of the Metropolitan Asylums' Board for 1906 (page 305), it is stated that, out of 4,937 cases of diphtheria, 247 cases (5·06 per cent.), had otitis, and 5 (0·10 per cent.), had mastoid abscess. In 1900 the percentage of cases of otitis was 7·42. Out of 1,000 cases of diphtheria, examined by Stangenberg,¹ 243 were found to have ear complications; of these 109 occurred in patients under 5, and 79 between 5 and 19 years of age, 16 had otalgia, 190 had Eustachian salpingitis, and 65 (6·5 per cent.) had exudative middle ear disease. As regards scarlet fever, the Annual Report of the Metropolitan Asylums' Board, for 1906, gives 2,355 cases of otitis (13·21 per cent.) out of 17,829, 122 of which (0·68 per cent.) had mastoid abscess. In the Report for 1907, the percentage of ear complications was 11·4. Burckhardt-Merian,² out of 4,309 cases of otitis media collected from different authorities and countries, found 445 (10½ per cent.) due to scarlet fever. At the Willard-Parker Hospital,³ in 1898, of 386 cases of scarlet fever, otitis occurred in 77, 33 of which were bilateral. In 1809, 387 cases showed otitis in 43 (23 bilateral). Thus, out of 773 cases, nearly 20 per cent. had

otitis, and of these $\frac{1}{3}$ were bilateral. Le Marc'hadour⁴ found 36 instances of otitis (10·65 per cent.) out of 339 scarlet fever cases.

I propose to discuss the ear complications of true diphtheria first, taking those of scarlet fever, including the so-called scarlatino-diphtheritic forms, second, and considering the treatment of all forms together.

The diseases of the ear in *diphtheria* fall into four groups :—

- (1) Diphtheritic inflammations of the external auditory meatus.
- (2) Diphtheritic inflammations of the Eustachian tube and middle ear.
- (3) Acute catarrhal and purulent inflammations of the middle ear without the formation of membranes.
- (4) Internal ear affections.

Diphtheritic inflammations of the external meatus are decidedly rare. They are usually complicated with diphtheria of the auricle, and are seldom primary, but accompany scarlatinal diphtheria of the pharynx and middle ear, extending to the meatus through a perforation in the tympanic membrane. Most of these cases are not true diphtheria, and those in which the bacillus of that disease has been found, are uncommon. It must be pointed out that there is a great deal of confusion in the literature between the aural complications of true diphtheria and scarlatinal diphtheria, a confusion which commenced in, and has apparently continued from, the pre-bacteriological days. A classical case, in which the diphtheria bacillus was isolated, has been recorded by Freital.⁵

Primary meatal diphtheria may develop, during an epidemic, on parts of the canal excoriated from an already existing otitis externa. Blau saw diphtheria of the pharynx develop from a primary diphtheritic inflammation of the external meatus.

In such cases, the meatal walls become covered with dirty, greyish-white membrane, which will not come away with the syringe, but requires forcible loosening, and, when picked off, leaves the parts beneath ulcerated and extremely painful. Certain diagnosis can, of course, only be made by the discovery of the specific bacillus.

Primary diphtheria of the middle ear is very rare, the only authentic instance, which I can at present find in the literature, is the observation of Burckhardt-Merian, mentioned by Politzer

in his text-book. Secondary involvement of the tympanic tract is, however, common, indeed, out of 25 *post-mortem* examinations, Siebenmann found only one normal middle ear. These cases have, it must be repeated, been largely confounded with those of scarlatinal diphtheria. They develop usually at the crisis of the nasopharyngeal diphtheria, seldom during its decline. They are usually very painful, and swelling of the neighbouring glands is more frequent than in simple otitis. Some account of the published cases of true middle ear diphtheria will be found in Friederich.⁶ The middle ear may be affected alone, or in combination with the tube, and diphtheritic membrane may be found adhering to the tympanic walls; in a case of true diphtheria, reported by Lommel,⁷ membrane formation was found in individual mastoid cells. The symptoms are those of acute suppurative otitis media, and the course is similar to that in the same complication or scarlet fever, viz., rapid and large perforation, protracted suppuration, with extensive destruction, even leading to partial or complete necrosis of the labyrinth (panotitis). Glandular swelling is more frequent than in simple otitis, and pain is usually severe.

Acute catarrhal and purulent middle ear inflammations, without the formation of membranes, also occur in the course of true diphtheria, but are less common.

Apart from the labyrinthine complications of suppuration, a few cases of nerve deafness have been recorded. They are usually of the nature of post-diphtheritic paralysis, as in the case described by Eeman,⁸ in which double auditory neuritis, accompanying a post-diphtheritic paralysis of the soft palate, yielded to a long course of pilocarpin treatment.

It may, in conclusion, be pointed out that Leland⁹ has stated that, since he had advised against irrigation of the nasal chambers in diphtheria, serious ear complications had become less frequent in his practice.

The *treatment* of diphtheritic inflammation of the auditory meatus should be strictly antiseptic. In the primary disease, the meatus should be filled with lime-water from time to time, to assist in loosening the membranes. This should remain in the passage for 15 or 20 minutes, and the latter should be syringed with antiseptic solution. The repeated formation of membrane may be met by painting with carbolic-glycerine

(1-15), or carbolic-alcohol (1-20), or instillations of sublimate-alcohol (0.05-50.0), or salicylic-alcohol (1-100).

The treatment of the middle ear complications will be considered when dealing with those of scarlet fever.

Epidemics of scarlet fever vary in the number and severity of their complications, and those affecting the ear form no exception. The percentage of ear affections, however, is, as has been seen from the statistics quoted, fairly constant. The severity varies with the epidemic, climate, and season of the year. Middle ear inflammation is the most serious complication, and the importance of its early recognition and treatment is enormous.

The conditions met with may be best considered as due to: (1) the toxins of the disease; (2) extension from the throat; (3) the general weakness induced by the fever.

1. Toxins are undoubtedly the cause of those cases (*a*) which occur with the general toxæmia of the system at the outset of the scarlet fever; (*b*) those in which the labyrinth is affected without the middle ear being attacked, and those in which panotitis occurs; (*c*) those which occur during the period of desquamation, when all acute symptoms have disappeared, that is, in the second and third weeks, at which time nephritis is most often met with. The virulence and destructive nature of many of the ear conditions cannot be accounted for in any other way than by the action of powerful toxins.

2. Extension from the throat along the Eustachian tube occurs from the intense pharyngitis and pseudo-membranous, or diphtheritic angina. The presence of adenoids favours this form.

3. The general weakness, which follows all debilitating diseases, predisposes to otitis, and the absorption of fat at the Eustachian openings probably allows an easier entry to infection.

As regards the *Bacteriology* of these cases, Haszlauer¹⁰ has pointed out that the *Streptococcus pyogenes* is the micro-organism most commonly found. *Staphylococcus pyogenes albus* and *aureus* are also found. Fränkel's pneumococcus and Friedlander's pneumobacillus are also met with. The Klebs-Löffler bacillus has been obtained in later cultures, and appears to develop where the system is weakened. According to Leutert,¹¹ streptococci work in the destruction of bone,

and the formation of sinus thrombosis, and diplococci are responsible for epidural abscess.

Taking the different parts of the ear in detail, the *External Ear* may be the seat of a dermatitis, when the rash affects the auricle. The meatus may become swollen sufficiently to cause discomfort, but this usually passes away with the subsidence of the acute symptoms.

The *Middle Ear* complications are the most serious and important. Two varieties of inflammatory attack are to be distinguished—the catarrhal and the purulent. The former is usually mild. The tympanum often contains more or less sero-mucoid exudation, the membrana tympani being moderately congested, often presenting a peculiar bright appearance, and the level of the exudate being easily seen. There may, however, be loss of lustre, with bulging. In about 20 per cent. of cases, the infection spreads from the naso-pharynx *viâ* the Eustachian tube, and the resulting acute otitis is nearly always associated with tympanic suppuration. The pathological change consists in an inflammation of the whole middle ear tract, and, where the tract is bony, there is not merely an inflammation of the mucosa but an osteitis. The type is, consequently, usually severe. The membrane of Shrapnell, and the handle of the malleus are intensely congested. General œdema follows quickly, with stasis and necrosis; the membrane bulges, perforation is rapid, and destruction of a large part of its substance follows, so that the resulting loss of tissue is extensive. Discharge is at first sero-purulent, but rapidly becomes purulent, and ossicular caries and burrowing of pus ensue.

A small proportion of cases recover at the termination of the acute stage, the majority degenerate into a condition of chronicity, characterised by more or less abundant secretion, or are marked by a hyperplasia of the mucous membrane, with adhesions between the various parts. In the former type, exposed necrotic bony tissue will be found, with highly foetid pus often mixed with blood, and abundant granulations. The bony labyrinth, mastoid, and sigmoid sinus may become rapidly involved, and meningeal or brain complications may occur.

Two good instances of the serious nature of these complications have been published by Trouchaud¹² and Koller.¹³

The former case, a girl, aged 12, had severe sore throat and copious eruption. There was no albuminuria. The temperature was raised to over 104° . In spite of careful antiseptic treatment of the upper air passages, purulent rhinitis appeared, and, 14 days after the onset of the scarlet fever, a right cervical abscess, with empyema of the right maxillary and frontal sinuses and ethmoid cells. Bedsores occurred, and the temperature remained high, but the nasal condition improved. A week later, great pain was complained of in both ears, both membranes were freely incised and pus evacuated. The left ear recovered, but right mastoid empyema, with pus in the tip cells, necessitated operation. The temperature reached the normal eight days later, and the patient finally recovered.

The second case, a girl, aged 4, was attacked by vomiting, lasting three days, and fever. A scarlet-fever rash appeared on the second day, and, two days later, diphtheritic membrane in the throat and glandular swelling. At the end of the first week, pain and deafness occurred in both ears, purulent discharge following within 24 hours of the first ear symptom. No aural surgeon was consulted until 51 days later, when there was double otorrhœa, with tenderness over both mastoids. The right ear showed a large perforation with exuberant granulations, and bare bone was evident in the left. A left radical mastoid operation was performed, and the attic and antrum were found full of pus and granulations, in which the ossicles were embedded. A sequestrum, composed of the superior and external ampullæ and adjoining parts of the canals, was removed, the facial nerve being found denuded. Recovery was uneventful.

A third case, in which there was rapid necrosis of the temporal bone, was recorded by Packard.¹¹

Serious labyrinthine necrosis may be delayed for months or years, and I recently operated¹² upon a girl, aged 22, in whom I found complete necrosis of the right labyrinth, due to suppuration following scarlet fever in childhood.

The labyrinth may become affected through the fenestræ, or may be primarily attacked by the virulence of the inflammation.

Attention is usually first drawn to the ears by the occurrence of pain, but the patient may be either so ill or so young that this symptom may pass unnoticed, and the first intimation

then may be only the onset of discharge. Bearing this in mind, it cannot be too strongly emphasised that a routine examination of the ears should be made from day to day. Further, any continued, or otherwise unaccountable temperature, occurring during the second or third week of the general disease, or any sudden rise of temperature in that period, should at once attract attention to the ears.

The *internal ear* may be attacked, without suppuration, by the toxins of scarlet fever, leading to nerve deafness. The symptoms and functional signs of such complication need not be described, but, marked deafness without discharge, especially when accompanied by vomiting, vertigo, and nystagmus, should be at once recognised, and treated by the doctor.

Treatment.—The dermatitis of the external ear, referred to above, may be met by mild dusting powders of starch talc, or magnesia, alone or in combination.

The middle ear complications need prompt attention. The question of *prophylaxis* necessarily requires to be dealt with first. I think that it cannot be too strongly insisted upon that the proper removal of tonsils and adenoids, and the correction of other forms of nasal obstruction, are of vast importance in all children and young persons, in order that the strain of scarlet fever, should they be unfortunate enough to contract it, may be made to fall less heavily upon their upper air passages. I have elsewhere referred to this matter,¹⁶ and it is one which requires a wider recognition among practitioners other than specialists. It has also been well emphasised by Jarecky.¹⁷

In patients with scarlet fever, every endeavour should be made to keep the upper air passages clean and free from secretions. The means at disposal are nasal douches, mouth washes, sprays, paints, and lozenges. Bertram Thornton¹⁸ recommends the use of 1 in 2,000 perchloride solution for the daily disinfection of the mouth and fauces by means of the spray. Meredith Young,¹⁹ in a useful paper, points out that reliance must be placed upon the destruction of the local toxin-factory, or the weakening of its operatives so that their output is lessened, and describes a series of valuable experiments made with various bactericides. With gargles, he found Izal good as a germicide, but painful to the patient. Douching of the throat with 1 in 1,500 perchloride, or 1 in 200

liquor calcis chlorinatae, gave good results, but is difficult, and dangerous if improperly done. In practice, he found swabbing of greatest value, with the following solution :—R Acid. Boric. $\bar{3}i$, Spir. Vini rect. $\bar{5}ijss$, Glycerin. $\bar{3}vij$. He also tried various antiseptic lozenges, and obtained excellent results with Formamint tabloids (Wulfin). He gives results showing the influence of this preparation upon the percentage of otitis and rhinitis in scarlet fever, and adds details of five cases. As regards douching the nose, Young says that the necessity of treating the post nasal space requires emphasising, and that the extra time and trouble taken receive full payment in the shape of much earlier cure. He prefers sulphate of zinc (gr. j—ij to $\bar{3}j$ at the most), and points out that the nasal douching must be done in the *most gentle manner possible*, and, when the condition is showing signs of abatement, it is better to stop the douching altogether. He considers that the continuance of troublesome nasal discharges after scarlet fever, diphtheria, and measles is due, in the majority of cases, to improper prolongation of treatment.

It would appear that, of the various methods of treating the upper air-passages in scarlet fever and diphtheria, with a view to the prevention of aural complications, gargling possesses no advantages, but several serious disadvantages. Spraying is little better than gargling, and the only trustworthy methods are swabbing and douching. In Young's opinion, antiseptic lozenges form the ideal line of treatment.

Gordon²⁰ states, in his Report for 1907, that, previous to that year, it was the routine practice to douch the nose and fauces with sterilised water. After January, 1907, this was done only in the most severe cases. The remainder had no local treatment of the fauces, the mouth being kept clean by swabbing with various lotions, or plain water only. As a result, the incidence of otitis not only did not diminish, but slightly increased from 19·7 to 20·4 per cent., and rhinitis increased threefold. Nephritis also rose from 2·6 to 4·2 per cent. This, Gordon considers, was due to withholding the nasal douche, and, therefore, confirms his opinion of 1903, that not only the fauces, but the nose also should be douched daily.

Throughout his attendance upon cases of scarlet fever and diphtheria, the doctor should pay unremitting daily attention to the ears, and be prepared to act promptly upon their implication.

At the Monsall Fever Hospital, taking all cases of scarlatinal otorrhœa, 84·5 per cent. were curable by intra-tympanic methods. At the first onset of symptoms, hot antiseptic irrigations of from a pint to a quart, with applications of dry heat, and the use of leeches, may be tried, but if there is no abatement in 12, or, at the most, 24 hours, the membrane should be widely incised. The importance of early incision (paracentesis) requires to be emphasised. It must be remembered that, in scarlatinal otitis, there is an infection of the whole middle ear tract, from the Eustachian tube to the mastoid antrum, accompanied, where the tract is bony, by a definite osteitis; adequate drainage is, therefore, of paramount necessity. After incision (repeated if necessary) the use of antiseptic irrigation, with perchloride solution 1 in 1,000—2,000 preferably, combined with instillations of peroxide of hydrogen, or spirit, must be continued. A sharp watch must be kept for the occurrence of serious complications, and these must be promptly met. The question of further treatment is a vital one. The papers published by Gordon,²¹ and his report already referred to, are most valuable in drawing attention, in this respect, to the duties of medical officers attached to fever hospitals. The otitis of scarlet fever has been too much neglected in our fever hospitals, and this would best be remedied by the appointment of consulting otologists to these institutions. A review of the work done at Monsall will best show the nature of the work required. As has been said, 84·5 per cent. of the cases of otitis were curable by intra-tympanic methods. In the remainder, discharge persisted, and this was almost certainly due to the presence of dead bone, and its products, on the mastoid side of the tympanum, often associated with necrosis of the ossicles or tympanic walls. In such cases, two courses are open; to refer them, later, to an aural surgeon; or to try to cure them whilst still in hospital. The latter course should be pursued, as the patients may still be infective, and are often in danger from their ear condition. The methods used at Monsall were either the Schwartze, or the radical mastoid operation. Of 40 cases of the former, 20 failed to cure the discharge and 4 proceeded to the radical operation. Hearing was improved in only 10 per cent. Of the 118 radical operations, 2 died from metastatic meningitis. In one there was already total

deafness from extension of the disease to the middle ear. In every other instance, the condition was cured, and the hearing improved, the average time of recovery being seven weeks. In 49 other cases, the radical operation was performed in the acute stage of the disease for mastoid abscess or serious septic absorption. In 1907, Schwartz's operation was done five times in selected cases, and 21 times for the relief of local symptoms. The radical operation was performed in 30 cases, all of which resulted in improved hearing. As a rule, the operations showed a greater extent of destruction than was expected. The number of cases given by Gordon, in his paper of June 1906, of scarlatinal otitis treated is 340, and in these the radical mastoid operation was performed in 15.6 per cent. The period of operation was from one to two months after the onset of the discharge, and in no case was it undertaken until intra-tympanic treatment had been tried, for at least one month, without obvious effect. From the considerable experience, afforded by this series of cases, it is evident that the Schwartz operation is to be restricted to those in which it is required for the relief of local symptoms, and that the radical operation is to be preferred where, after adequate trial, ordinary intra-tympanic methods have failed.

It remains to add a few words concerning the relation of diphtheria and scarlet fever to *deaf-mutism*.

Diphtheria is seldom reported as a cause of deaf-mutism. The American statistics, for 1880, show only 70 instances out of 10,000 cases of the acquired condition (0.7 per cent.). According to Mygind,²² the percentage in Saxony is 0.3, whilst, in Italy, it is the comparatively high one of 5.3. Lemcke found, from a comparison of statistics, that 1.5 per cent. of all cases of acquired deaf-mutism was due to diphtheria.

The case, as might well be expected, is different with regard to scarlet fever. Wilde, whose statistics are the earliest, gave 7 per cent. of cases of acquired deaf-mutism, in Ireland, in 1851, as due to the disease. In Germany, Hartmann²³ gives 11.3 per cent. Other statistics give:—Italy 1.5, Pommerania-Erfurt 9.9, Austria 10.8, Würtemberg and Baden 15.0, Ireland 16.8, North America 16.9, Mecklenberg Schwerin 24.4, United States 26.4, Norway 27.5, Saxony 42.6, and Denmark 20.8. From these it will be seen that scarlet fever gives rise to acquired deaf-mutism in from 1.5 to 27.5 per cent. of cases.

The cause of the deafness lies, usually, in the partial or entire destruction of the labyrinth from middle-ear suppuration, a fact supported by the observations of Moos,²⁴ Uchermann,²⁵ Bryant and Sears,²⁶ and Mygind.²⁷ It must be remembered, however, that the labyrinth may be affected by scarlet fever without middle-ear inflammation occurring. Instances are cited by Hartmann²⁸ and Schmalz.²⁹

It is seldom that serious deafness resulting in deaf-mutism appears at an early stage of scarlet fever. According to Burckhardt-Merian,³⁰ the majority of such cases show themselves during the stage of desquamation. Deafness of this nature may also be accompanied by disturbances of equilibrium.

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ON THE DIAGNOSIS OF SCARLET FEVER AND
DIPHTHERIA.

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AN idea of the amount and variety of error made in the diagnosis of these diseases in London, can be obtained by a reference to the statistics published by the Metropolitan Asylums' Board. In the year 1907, of 24,434 cases, sent to the fever hospitals with the diagnosis of scarlet fever, 1,670, or 6·8 per cent., turned out to be some other disease, a small proportion, even though these figures do not include the whole of the mistakes ; for a considerable number of cases of scarlet fever are sent to hospital as diphtheria, and these being returned in the statistics as diphtheria, do not appear in the table of erroneous diagnoses.

Of 6,924 cases certified to be diphtheria, 1,180, or 17·0 per cent., were found to be some other disease.

That all this error is avoidable cannot be maintained ; but some of it is ; and this I believe to be quite an appreciable part. I too often see cases sent to hospital, in which the diagnosis has been made on insufficient data ; and my experience coincides with that of my colleague, Dr. F. M. Turner, of the South Eastern Hospital, that more mistakes occur amongst cases sent from the general and children's hospitals than amongst those sent in by general practitioners.

The limits of this article will not permit me to discuss the differential diagnosis of scarlet fever, or diphtheria, and all the diseases which have been mistaken for them. Nor is such a discussion necessary ; for a reference to the table, from which I have already quoted, will show that though the list of mistaken diseases is somewhat lengthy, yet the bulk of the cases is confined to a few of them. Thus 377 cases of rubella (German measles), 323 of various forms of erythema, 264 of tonsillitis, and 137 of measles were mistaken for scarlet fever. Besides these there were 298 cases, in which nothing amiss with the patient could be detected after admis-

sion. The next largest numbers are pneumonia, 43, and chicken-pox, 35. In diphtheria the limitation is even more pronounced. Of the 1,180 cases, 879 were of various forms of inflammation and ulceration of the fauces, including Vincent's angina and post-pharyngeal abscess; and the next largest number were 73 of measles, 44 of laryngitis, and 33 of pneumonia.

SCARLET FEVER. Difficulties of diagnosis occur:—

1. *On account of the sore throat:—*

- (a) In the earliest stage before the rash comes out,
- (b) In cases in which the rash is wanting.

Cases under these headings may be dealt with together. They indicate diphtheria, tonsillitis, and other kinds of faucial inflammation, and certain acute diseases such as pneumonia.

2. *On account of the rash:—*

In this group are nearly all the cases of erythema, rubella, measles, chicken-pox, and a large number of those, in which no obvious disease can be found on the patient's arrival at hospital.

3. *On account of the desquamation:—*

In this group are some of the cases of erythema, rubella, measles, and no obvious disease.

1.—(a) and (b). It is impossible to be sure that a case is one of scarlet fever till the rash comes out. Its appearance is seldom delayed beyond the second day. Symptoms which suggest scarlet fever are repeated vomiting, headache, pallor round the mouth and nose, enlargement of the filiform papillæ of the tongue (the inflamed papillæ protruding as red points through the white fur), and, if the temperature is but moderately raised, say not above 101° F., a pulse, the frequency of which is out of proportion to the height of the temperature. An excessive frequency of the pulse is met with at the beginning of other diseases than scarlet fever when the temperature is considerably raised, as, for instance, in diphtheria, measles, acute pneumonia, and even acute tonsillitis. But the only instances in which the observer can be fairly certain that the case of the kind I am now dealing with is one of scarlet fever, are those in which there is clear evidence or history of exposure to infection.

Scarlet fever is not infrequently mistaken for diphtheria. The error is usually made in cases of anginous (or septic)

scarlet fever, in which the rash comes out late, after the third day, or in which there is no rash. But, I am sorry to say, I have more than once had brought to my notice cases, in which the wrong diagnosis has been made because the certifying practitioner has omitted to look for a rash. It is a good rule, in cases of sore throat, always to inspect the patient's trunk, no matter what may be the faucial lesion. However, in the cases I am now discussing, the rash is tardy or absent. These cases are usually severe, and present the following symptoms: continuous pyrexia, delirium, extensive inflammation of the fauces followed by ulceration, inflammatory enlargement and matting together of the cervical glands, often with implication of the skin. The patient emaciates quickly. In diphtheria the temperature is raised at the onset, but quickly falls, perhaps to rise again with the extension of the membrane or the occurrence of some complication. After three or four days, even when there is much membrane, it is about normal. Delirium is decidedly unusual in diphtheria. The faucial lesion in diphtheria is sharply defined and often limited; in anginous scarlet fever it is widespread. Ulceration is rarely seen in diphtheria. In diphtheria, the glands are moderately enlarged and not matted together, nor is the skin inflamed. It is true that there may be a great deal of swelling of the neck, but it is usually white and puffy, does not pit on pressure, and is not brawny. Treatment by diphtheria antitoxin has no effect in scarlet fever, whereas a beneficial effect is noticeable in a day or two in diphtheria, and is often striking. Diphtheria bacilli are usually absent from these cases of scarlet fever.

2. Erythematous rashes of various kinds, apart from those found in other specific fevers, constitute the bulk of the mistakes in this group, except when rubella happens to be prevalent, as was the case in 1907. In my experience, the most frequent are those fugitive rashes that are met with in children, especially young children. They are usually patchy, and, more often than not, are lacking in the puncta seen in the rash of scarlet fever. Sometimes they are caused by the wearing of flannel. A very intense erythema may be set up in an infant by vigorous screaming, and will continue so long as the child screams, and often for several minutes after it has

ceased. With these rashes, however, there is rarely any rise of temperature or sore throat.

An enema of ordinary, hard, yellow soap will give rise to an eruption very much like that of scarlet fever. It appears within twenty-four hours of the administration of the enema ; usually there are no other symptoms. Since the *sapo mollis* of the B.P. has been in use for enemata at the Eastern Hospital, enema rashes have ceased to occur.

Drug rashes are seldom sent to hospital as scarlet fever. Belladonna, quinine, opium and morphia, mercury (especially calomel), chloral hydrate, salicylate of soda, and iodide of potassium may each give rise, on occasion, to a scarlatiniform rash. The rash of copaiba is usually papular and patchy. Most septic rashes are blotchy, and especially affect the extensor surfaces of joints. In my experience, a scarlatini-form rash, following the infliction of a scald or burn, is in most cases a sign of scarlet fever. With this exception, all these rashes are unaccompanied by any of the other symptoms of scarlet fever. Very rarely, indeed, should the diagnosis of scarlet fever be made when a rash is the sole symptom. Strong corroborative evidence should be forthcoming.

In measles, chicken-pox, and small-pox an initial rash occurs which closely simulates that of scarlet fever. In measles and chicken-pox it is usually confined to the trunk ; in the former disease the rash is common, less so in the latter. Measles can be recognised by the presence of Koplik's spots, which are almost invariably present. These are minute, whitish spots on the buccal mucous membrane. In order to see them satisfactorily a good light is essential. The initial rash of chicken-pox is quickly followed by the vesicular eruption ; often, indeed, the erythema is not initial, but is accompanied by the vesicles.

The initial rashes of small-pox are of two kinds, the erythematous and the petechial. I refer only to those which simulate scarlet fever. The erythema appears on the first or second day. It may be distributed, more or less universally, over the trunk and limbs, and even the face, or it may be limited to the regions of joints and small areas on the trunk. Usually these rashes are not so markedly punctate as the

rash of scarlet fever. According to Dr. MacCombie they are not met with in children under ten. The petechial rash especially affects the abdomen below the umbilicus, and the upper and inner aspects of the thighs, a distribution which is diagnostic of small-pox. The petechiæ are of a brick-red colour and are very numerous, especially towards the centre of the affected regions, where they are densely crowded, and of a purple, sometimes a brownish, colour. The petechiæ are not always confined to the regions mentioned. Often there is a bright erythema in addition to the petechiæ. The initial symptoms of small-pox are intense frontal headache, lumbar pain, aching of the limbs, sore throat, and, in children, vomiting.

But of all the diseases, in which there is an erythematous rash, rubella is that which gives rise to the greatest number of mistakes. Fortunately it is an affection which is not always prevalent. In epidemic years it occurs especially during the months of March to June. The rash of rubella commences on the face as small, discrete, pink spots; very quickly the trunk and upper extremities are invaded, and, lastly, the lower extremities. On the second day, the rash will have faded from the face, and have lost its spotty character on the trunk, where it has now assumed the form of a diffuse erythema, frequently punctate. At this stage, therefore, there is a very close resemblance to scarlet fever. But discrete spots will still be seen on the lower extremities, which have been invaded later than the trunk. The conjunctivæ are frequently injected, and the posterior cervical and other superficial lymph glands moderately enlarged. There may be sore throat, but, on inspection, there is little to be seen beyond slight catarrh of the fauces. In most instances the rash is one of the first signs of the disease. The constitutional symptoms are very slight. Vomiting is rare. There is no pallor round the mouth and nose. If the practitioner sees the case while there are still spots on the face, the diagnosis from scarlet fever is not difficult, as the face is unaffected in that disease.

The cases in which no disease is to be found on the patient's arrival at hospital are, in all probability, mostly cases of transient erythema such as have been mentioned above.

3. Desquamation is a fruitful source of error. There appears

to be no inconsiderable number of medical men, who hold to the beliefs that every case of scarlet fever desquamates, and that all desquamation is due to scarlet fever. Both these beliefs are erroneous. Not a few cases of scarlet fever do not peel; and peeling of some sort is common to all forms of erythema and dermatitis. I have seen the most profuse peeling after measles, rubella, and antitoxin, and other erythematous rashes. Nor is the so-called "pin-hole" desquamation, proof positive of an attack of scarlet fever. It certainly, however, follows the rash of scarlet fever more often than that of any other disease. Pin-hole desquamation on the trunk and thighs, with small tags of skin round the finger- and toe-nails, and about the ears and eyes, is very suggestive of scarlet fever. A history of recent sore throat renders the diagnosis of scarlet fever fairly certain. If nephritis, otitis, a discharge from the nose, or a strawberry tongue is present, the diagnosis is quite certain.

I can do no more than allude to recurrent scarlatiniform erythema. Fortunately it is of rare occurrence, because it is very difficult to distinguish a first attack of it from scarlet fever. Many of the cases are not recognised till there have been two or three recurrences to arouse suspicion. There are sore throat, vomiting, pyrexia, and a rash, which, though scarlatiniform, is patchy, and confined to the trunk. The rash usually persists for some time. Desquamation takes the form of thin whitish flakes. Erythematous patches may remain, which have a peculiar greasy and glistening appearance.

DIPHTHERIA. The large majority of the misdiagnosed cases of diphtheria are cases of tonsillitis, simple or follicular. This is hardly to be wondered at, considering that the appearance of the tonsil in diphtheria, at its beginning, has little to distinguish it from tonsillitis due to other causes. But, in a very large number of cases of diphtheria, unless they are treated at the very commencement with antitoxin, a definite membrane quickly forms; and the presence of membrane may be taken to be a certain sign of diphtheria. An inflammation of a tonsil, or of the fauces, which has been going on for three or four days without membranous formation, is most probably not diphtheria. In diphtheria the inflammation, at any rate to begin with, is not extensive, but limited, and, as it spreads, there is a well-

defined edge to the exudate. Pain is not a marked feature of diphtheria. If there are signs of laryngitis the case is almost certainly one of diphtheria. It is most desirable that a bacteriological examination of the exudate should be made as early as possible. If the result is positive, the case should be treated as diphtheria; if it is negative, another culture should be taken, unless in the meantime the occurrence of other symptoms has removed the element of doubt from the case.

Sloughing and ulcerative lesions of the fauces are rarely diphtheritic. The one which most closely simulates diphtheria is the spreading ulceration, which some writers have termed pseudo-diphtheria, and others Vincent's angina, a not uncommon affection. There is ulceration of a tonsil or the uvula or the edge of the palate; it may remain limited or spread extensively, even to the pharynx or larynx. The ulceration is secondary to sloughing, and the slough bears some resemblance to the membrane of diphtheria. If the lesion is recognised to be a slough, then diphtheria can be excluded. In Vincent's angina there are pyrexia and wasting; and, in severe cases, the condition is not unlike what is seen in scarlatina anginosa. There is often ulceration of the tongue and mouth as well. In fact the disease seems to be the same as ulcerative stomatitis, the ulceration being limited to the fauces.

Scarlet fever is often mistaken for diphtheria; but the chief differences between the two diseases have already been pointed out.

In acute septic inflammation of the fauces, there is usually extreme œdema of the fauces with a high temperature and severe constitutional symptoms. The disease begins sharply and progresses quickly. The onset of diphtheria is frequently very insidious.

The differentiation of laryngeal diphtheria from other forms of obstruction of the larynx is difficult when there is no faucial implication. In most cases laryngeal is secondary to faucial diphtheria. But occasionally the disease begins in the larynx, or the faucial exudate may have disappeared before the patient is brought under the practitioner's observation, or it may affect an area not within his view, such as the posterior aspect of the soft palate. In these circumstances, the diagnosis may be very uncertain. The

first step towards ascertaining the nature of the disease is to make a digital examination of the fauces and laryngeal orifice. By this means a foreign body or a post-pharyngeal abscess may be detected, and the condition of the parts examined can be ascertained. A post-pharyngeal abscess can often be seen on inspection of the fauces, but sometimes it is low down and out of sight. While, in post-pharyngeal abscess, the voice is usually unaltered, it cannot be said that in diphtheria it is always lost; so that the condition of the voice is of little value in diagnosis. In rare cases a growth may project over the laryngeal orifice and give rise to obstructive signs. This can be detected by the finger. If there are none of these causes, the buccal mucous membrane should be searched for Koplik's spots; for an attack of measles often begins with laryngitis, in consequence of which the diagnosis of diphtheria is made. As cases of measles are highly infectious, even in this stage of the disease, it is of the utmost importance that the diagnosis should be correct. Occasionally laryngitis complicates influenza; usually this form of laryngitis is not severe. In scarlet fever, too, the larynx may be implicated; this usually occurs in very severe anginous cases after the illness has existed for several days; so that the diagnosis is not difficult. All these diseases having been excluded, the diagnosis almost invariably rests between primary laryngeal diphtheria and simple laryngitis, which is by no means an uncommon disease in young children. Haply the patient may cough up a fragment of membrane. But if not, a bacteriological examination should be made, and the diagnosis determined by the result. As laryngeal diphtheria is a very grave form of the disease, serum should be administered at once, without waiting for the result of the bacteriological examination.

It should be borne in mind that diphtheria is prone to occur as a complication of most of the acute infectious diseases, especially those of children. But it usually arises late in the course of the disease, often, indeed, during convalescence; so that, for instance, while the initial pre-eruptive laryngitis in measles is not due to diphtheria, the late, post-eruptive laryngitis usually is. Laryngismus stridulus is occasionally mistaken for diphtheria. This disease occurs in children under two years of


age, who are the subjects of rickets. The spasms recur, and may be attended by convulsive movements of the limbs. Between the attacks the respiration and voice are unaffected, whereas in the laryngitis of diphtheria, though spasmodic attacks are frequently observed, seldom are the patient's breathing and voice unaffected in the intervals.

In nasal diphtheria a certain diagnosis can be made only when membranous casts of the fossæ are shed, or a bacteriological examination has yielded positive results.

Diphtheria of the vulva can hardly be mistaken for any other affection than erysipelas. In diphtheria there is almost always a definite membrane, and there is no advancing edge to the inflamed area, such as is characteristic of erysipelas.

Diphtheria of the skin may appear in at least three varieties. In the first, a wound or a raw surface, such as is found in eczema, is covered with a layer of membrane. In these cases the diagnosis is not difficult. But in a few cases diphtheria takes the form of localised gangrene. Probably the disease in these cases is set up by accidental inoculation. Lastly, the diphtheria bacillus appears to be capable of setting up a chronic vesicular eruption. In the last two varieties the diagnosis chiefly depends upon bacteriological observations.

I have not alluded to the characteristic paralysis which follows an attack of diphtheria in a considerable proportion of the cases. Doubtless the diagnosis of a few cases of sore throat of a doubtful character is cleared up by the subsequent occurrence of this paralysis, of which the distinctive features are paralysis of the palate and ciliary muscles, a squint, difficulty in swallowing, weakness of the lower extremities, and unsteadiness of gait. But my object has been to discuss the diagnosis of diphtheria in the early stage. Similarly, an attack of nephritis may reveal the true cause of a doubtful rash or sore throat three or four weeks after its occurrence. Certainly, however, where diphtheria and scarlet fever are suspected, these diagnostic sequels should always be remembered, and the case should not be finally dismissed from observation for three weeks from the beginning of the illness.



NOTES ON THE DIAGNOSIS OF SCARLET FEVER
AND DIPHTHERIA.

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SCARLET FEVER.

A MILD case of scarlet fever, in which the symptoms are slight and transient in character, presents a very awkward problem to the inexperienced practitioner, and is not infrequently a stumbling-block to the expert. In this article it is not proposed to systematically discuss the diagnosis of scarlet fever, but rather to lay stress on certain points which may be of service to anyone who has seen but little infectious work. The subject may seem to some unnecessarily elementary, but its justification is to be found in the large number of cases, admitted each year into the fever hospitals of the Metropolitan Asylums' Board, in which there is a difference of opinion on the nature of the illness between the medical staff of the hospitals and the certifying practitioners. It is certain that, in a very large majority of these cases, the patients have been erroneously notified.

If the *rash* on the trunk has practically disappeared, the lower extremities should be examined. A triangular patch of punctate erythema on the inner aspect of the thigh, with its base towards Poupart's ligament, is very suggestive of scarlet fever. In the scarlatinal variety of *rötheln*, on the other hand, the rash is sometimes very marked on the outsides of the thighs when it is fading on the trunk. In some cases of scarlet fever, the rash persists during the second week as fine papules on the extensor surfaces of the arm and leg. When present in sufficient number to exclude the possibility of their being physiological in origin, these papules may prove an aid to diagnosis, since they are quite distinctive of scarlet fever.

In a doubtful case of this disease too much importance should not be attached to *desquamation* of the neck, unless it is certain that no local application of any kind has been used, since poultices, fomentations, and liniments can produce typical

pinhole peeling. For the same reason, any found on the inner sides of the thighs would be disregarded, if the child was in the habit of wetting itself. The region, in which desquamation is most likely to prove of material assistance in forming a diagnosis, is the front of the chest immediately beneath the clavicles. If pinholes, or the white points in the skin which precede the formation of pinholes, are found in this region towards the end of the first week of illness, the practitioner is almost certainly dealing with a case of scarlet fever. When examining a patient for peeling, the skin should, where possible, be drawn in different directions, as fine pinholes are thus opened out, and hence more easily seen.

The foregoing remarks on desquamation are necessarily limited in their scope, since the object of these notes is merely to direct attention to a few facts which may be of practical use to the uninitiated in the early diagnosis of scarlet fever. From this point of view, infra-clavicular peeling is the most helpful, because it is most typical of scarlet fever.

In septic scarlet fever, the condition of the *fauces* not infrequently leads to an erroneous diagnosis of diphtheria, the grayish-white superficial ulceration, which is seen on the soft palate, being mistaken for membrane. Careful examination will show that the margin of the ulcerated area is not raised above the unaffected portion of the palate, as it would be, were the condition due to the presence of membrane.

Great stress is laid by some writers on the characteristic appearance of the *tongue* in scarlet fever, and not enough said about its atypical conditions. As a result, the inexperienced observer finds it difficult to recognise a case as one of scarlet fever if the patient's tongue does not assume the appearance of a ripe strawberry. The tongue desquamates like the skin, but, being enclosed in a warm moist cavity, it peels more rapidly; and, as there are various degrees of desquamation of the skin in scarlet fever, and sometimes none at all, so we see the epithelium of the tongue behaving in a similar manner. In a typical case it begins to separate from the tip and edges at the end of the second day of illness, and in about 36 hours the organ presents a glazed red surface, on which the fungiform papillæ are very obvious. In milder cases, in which the faucial symptoms are less severe, the

filiform papillæ lose only a portion of their epithelium, so that, while the tongue is red with prominent fungiform papillæ, it does not present the glazed appearance of the completely peeled organ. Lastly, in some very mild cases, the tongue does not peel at all; but even in such cases, it may lose its fur at the time when it should shed its epithelium. The fact that it becomes clean, while the throat still remains inflamed, is very suggestive, since it is unlike what is seen in tonsillitis and diphtheria. The unripe "strawberry" tongue, in which the fungiform papillæ show through the coating of white fur during the first two days of the illness, is, I think, made more of than it deserves; since it is nothing like so constant or striking in appearance as the ripe "strawberry" or "raspberry" tongue.

The peeled tongue is occasionally seen in both measles and diphtheria. Its greater constancy of appearance in scarlet fever is sufficient justification for regarding its presence as a strong point in favour of a diagnosis of that disease.

Scarlatinal rheumatism, or scarlatinal synovitis, as it should rather be called, occurs towards the end of the first week of the illness, most commonly affecting the wrist joints. When present, it is a valuable aid to diagnosis in doubtful cases of scarlet fever. It should always be enquired for in such cases, for slight stiffness of the wrists may not be mentioned, unless the patient's attention is called to it. This symptom is, I believe, to be found more frequently than statistics would lead us to suppose.

It may happen that the patient is not seen until near the end of the first week. In such circumstances, a diagnosis of scarlet fever would be justifiable, if any two of the following symptoms were present:—

The remains of a punctate erythema on the upper and inner aspect of the thighs.

A peeled tongue.

Scarlatinal synovitis.

Infra-clavicular pinhole desquamation.

DIPHTHERIA.

The diagnosis of this disease has been profoundly influenced by the introduction of bacteriological methods. On the one

hand, these methods have facilitated the making of a diagnosis for those practitioners, who can easily obtain the opinion of a bacteriological expert, and who are satisfied to entirely rely on it. On the other hand, bacteriology has in a way increased our difficulties, since it has shown that the specific bacillus of diphtheria may be causally associated with mild forms of sore throat, which a few years ago would have been regarded as simple tonsillitis, while it has demonstrated the existence of harmless bacilli morphologically indistinguishable from the virulent diphtheria bacillus. This latter fact discounts the value of the bacteriologist's report, since he cannot, within 24 hours of receiving the swab, say whether it contains the virulent Klebs-Löffler bacillus, or a harmless imitation of that germ. Again, either may have been present in the fauces before the occurrence of a simple tonsillitis, and consequently stand in no causal relation to the condition. It might be urged, in regard to the two classes of diphtheria bacilli, that the question of virulence is immaterial, since there is always the possibility that a germ, which is harmless in the normal throat, may acquire virulence when the fauces become inflamed. In support of this theory there is at present no convincing evidence.

In mild forms of tonsillitis, diphtheria should be suspected if the exudation is limited to one tonsil, and febrile symptoms are slight, or even altogether absent. Of this form of diphtheria the following case is a good example. A young man complained of slight sore throat. His temperature was normal, he did not feel ill, and it was difficult to see how he could have contracted diphtheria, since he lived alone with his mother, and never came in contact with children. The one-sided character of the pultaceous deposit, together with the normal temperature, suggested a diagnosis of diphtheria, and from the culture which was taken, virulent diphtheria bacilli were obtained.

One occasionally sees cases of this disease in which the deposit is at first apparently limited to the posterior pillars of the fauces. If the tonsils are enlarged, membrane in this part of the fauces is only visible to direct inspection when the child retches, as this act tends to make the posterior pillars more prominent. It is consequently important that these pillars should be brought into the field of view, when a patient is

examined for symptoms that may possibly be due to faucial diphtheria.

If symptoms of laryngeal obstruction are present in a child whose fauces show no signs of inflammation, the possibility of the case being one of measles should not be forgotten, and the mucous membrane of the cheeks should be examined for Koplik's spots which will certainly be present, if the laryngeal condition represents the catarrhal stage of measles. By some practitioners, these spots are still regarded as a figment of the imagination; but anyone, who has worked in a fever hospital, knows how valuable they are in the early diagnosis of secondary cases of measles.

Vincent's angina, in its early stages, bears an extremely close resemblance to diphtheria. It is less uncommon than is generally supposed, and should always be thought of when a negative report is received from the bacteriologist concerning a case that appears to be one of membranous sore throat. The true nature of the illness becomes obvious when the sloughs separate, the loss of tissue that takes place in the structures involved distinguishing this variety of sore throat from diphtheria.

There is a form of diphtheria which does not receive the attention it deserves. I refer to *fibrinous rhinitis*. Clinically, this condition appears to give rise to no symptoms of ill-health, and is recognised only by the small patch of glistening white membrane on the septum. For its detection, the nose should be carefully dried, and light should be thrown into it by a mirror having a central aperture. Virulent diphtheria bacilli are always obtained in cultures made from these patches. The importance of fibrinous rhinitis lies in the fact that it may be the cause of severe faucial diphtheria in others, while the individual affected by it is not suspected of being the source of infection. It is an extremely mild form of primary nasal diphtheria, and in its course offers a strong contrast to those cases of naso-pharyngeal diphtheria, in which the involvement of the nasal fossæ adds so greatly to the gravity of the illness.



THE DIFFERENTIAL DIAGNOSIS OF SCARLET FEVER.

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It is of advantage to know the most likely sources of error, and the various points, to which attention should especially be paid, in coming to a correct diagnosis of scarlet fever from other morbid conditions. In the present paper, which is based upon the actual admissions at the Grove and Fountain Hospitals during 1907, I have attempted to supply the kind of information which should be of value.

The number of admissions was large, amounting to 3,257 cases of scarlet fever, so that the conditions may be considered as fairly representing the kind of pitfalls which beset one. During the year, two isolation blocks, containing two double-bedded and four single-bedded rooms, and two double-bedded and three single-bedded rooms, respectively (each room being furnished with a separate lavatory), were set aside for the treatment of the cases in which the diagnosis of scarlet fever was regarded as doubtful at the time of admission. This was supplemented for a portion of the time by a four-bedded cubicle ward, but this accommodation was unfortunately inadequate for the purpose, and some of the patients had to be admitted to the separation wards of the scarlet fever wards, for varying periods, until a vacancy could be found for them in the special isolation blocks. Cases of infectious diseases were not generally treated there: those patients, who were regarded as having scarlet fever, being transferred, in most instances, to a general ward as soon as a diagnosis was made. Fifteen patients were admitted with rubella, during the early part of the year, but not until they had been in hospital for a period of 10 or 12 days, so that they were probably free from infection in the majority of instances. The only other infectious diseases, treated in these wards, comprised 1 case of erysipelas, and two of whooping-cough.

The total number of patients, treated in the special wards,

during the year, was 196, and the diseases diagnosed, after admission, in these cases were as follow :—

Scarlet fever	-	-	-	-	-	36
Rubella	-	-	-	-	-	15
Erysipelas	-	-	-	-	-	1
Whooping-cough		-	-	-	-	2
Pneumonia	-	-	-	-	-	4
Alveolar abscess		-	-	-	-	1
Bronchitis	-	-	-	-	-	1
Empyema	-	-	-	-	-	1
Tonsillitis	-	-	-	-	-	34
Erythema	-	-	-	-	-	70
Seborrhœa	-	-	-	-	-	2
Xerodermia	-	-	-	-	-	2
No obvious disease	.	-	-	-	-	27
						<hr/> 196 <hr/>

71·2 per cent. of those, subsequently diagnosed as not scarlet fever, were regarded as doubtful by the medical officer who saw the patients in the receiving room, and never entered an ordinary ward. The remainder were isolated by myself, or by the senior medical officer, usually on the following day.

Family Associations.—In a certain number of the cases, which form the subject of the present paper, the diagnosis of scarlet fever was undoubtedly made, on account of the occurrence of several cases of illness in one family at about the same time. They group themselves into two classes, (*a*) those in which another member of the family was admitted with an undoubted attack of scarlet fever, and (*b*) those in which none of the patients showed evidence of that disease.

In (*a*) the error appears to have originated, in some cases, from a desire to obtain isolation for the patient at the earliest possible moment, a second member of the family being certified as having scarlet fever from his having vomited, complained of sore throat, or having had some slight evidence of malaise. In one instance, an attack of lobar pneumonia was apparently diagnosed as scarlet fever, and sent into hospital because another member of the family was, at the time, an inmate

suffering from that disease.

In (b), which form the larger proportion, the occurrence of a second case of illness in the house apparently led, in some instances, to a revision of the previous diagnosis; and the patient was admitted suffering from a sore throat, or some kind of rash, with another member of the family, who had had a similar attack some two or three weeks previously. It was not always possible to detect anything abnormal in the second of the two cases, while the former had entirely recovered from whatever the illness had been before his removal to hospital. In one instance, several members of a family, who suffered from xerodermia, were certified as having scarlet fever, apparently because another member of the family had had some illness a month previously. It was impossible to make any diagnosis, as the patient, who was evidently regarded as the source of the outbreak, had no longer any evidence of illness at the time of admission.

Many patients were certified to be suffering from scarlet fever who were diagnosed, after admission, as having other infectious complaints. These included 47 cases of diphtheria, 4 of chicken-pox, 30 of measles, 30 of rubella, 3 of whooping-cough, 2 of erysipelas, and 1 of tuberculosis. With the exception of the 15 cases of rubella, 1 of erysipelas, and 2 of whooping-cough, already mentioned, none of these patients were admitted to the special isolation accommodation.

INFECTIOUS DISEASES.

Scarlet Fever.—Thirty-six patients were subsequently diagnosed as scarlet fever, about whom doubt had existed at the time of their admission to the special isolation wards. The difficulty in these cases was generally the mildness of the original attack: the ordinary symptoms of scarlet fever having disappeared, or become indefinite, before the patient's removal to hospital. In such cases, a diagnosis can only be made by keeping the patient under observation until either the desquamation, which usually follows an attack of scarlet fever, commences, or some complication is observed, which is ordinarily associated with an attack of that disease.

Diphtheria.—Forty-seven patients, suffering from scarlet fever, were sent into hospital with the diagnosis of diphtheria. In most of these cases, the patient had been seen as an

out-patient in a hospital or dispensary, and the existence of the rash was not suspected. The injection of the throat is usually greater in cases of scarlet fever, and, in many of them, a punctate appearance on the soft palate is visible, corresponding with the rash on the skin. The deposit on the tonsils, and, possibly, on the uvula, is softer in consistence than diphtheritic membrane, and is difficult, in the early stages, to peel off in continuous areas; later, when ulceration occurs, and a slough forms, there is an obvious loss of substance. The mouth is generally in a dirty condition in scarlet fever, with strings of mucus between the tongue and palate, which often make a good view of the fauces a matter of difficulty. The tongue also is generally more thickly coated, and the pulse rate more rapid. In the majority of cases, the ordinary punctiform scarlatinal rash will be seen.

Chicken-pox.—In these cases, the difficulty lies in discriminating between cases which have chicken-pox only, and those which are regarded as having scarlet fever and chicken-pox concurrently. In connection with the attack of chicken-pox, a punctiform erythema, suggesting a diagnosis of scarlet fever, may be seen at any stage of the disease. It is, however, most common at the commencement of the attack, or about 24 hours before the ordinary varicella eruption appears. In differentiating the early cases, it is well to remember that two exanthems seldom occur synchronously, the incubation period of one or the other is usually slightly protracted, and the second exanthem begins to appear as the first is fading. The throat condition is usually indefinite. So far as the rash is concerned, it may copy very closely the eruption of scarlet fever, but it is not followed by desquamation.

Measles.—In 30 instances, a diagnosis of measles was made subsequent to admission. Difficulty appears to have arisen from two causes, (1) lack of familiarity with the ordinary appearance of cases of measles, and, (2) from the resemblance, which measles may present in its early stages, to scarlet fever, when seen on the first or second day of disease.

The cases, which are included under (1) were ordinary cases of measles, but, in some of these patients, the condition may have been by no means so definite at the time of notification. It is advisable to admit such patients for observation, if

sent to hospital, because in some of them one may be dealing with concurrent attacks of the two diseases.

(2) Under this heading are included patients, who were notified, when a prodromal measles eruption was present. The resemblance to scarlet fever may be very striking. The eruption is punctate in character, and closely resembles the ordinary scarlatinal rash; the tongue is furred, and the patient may complain of sore throat. The fauces will be found to show injection, and, in some cases, a slight amount of follicular exudation may be present upon the tonsils. The important points, to which attention should be paid, are respiratory catarrh, with discharge from the eyes and nose, the presence of Koplik's spots on the mucous membrane of the cheek, and the transient nature of the eruption. The difficulties, however, are so great that, in some cases, it is practically impossible to avoid confusing the two diseases.

Rubella.—Thirty patients, who were notified as cases of scarlet fever, were diagnosed as having rubella. As in the case of patients with measles, there were numbers of instances in which, in the receiving room, the condition appeared to be distinctive of rubella. In some of those, who were admitted on the second or third day of disease, the resemblance to mild scarlet fever was so great that it was impossible to be sure at first sight. The occurrence of similar attacks among other members of the family (who perhaps came under observation at an earlier period of the disease), and the subsequent progress of the case under isolation may furnish a clue.

NON-INFECTIOUS DISEASES.

The various forms of erythemata form by far the larger proportion of the various morbid conditions with which confusion is likely to arise. In the present series of cases, 70 out of 196 belong to this class. Under this general heading is included a variety of conditions, presenting varying degrees of difficulty in differentiation from scarlet fever. The cases, which resemble scarlet fever most closely are those in which the rash is punctate in appearance, and general in its distribution. In some of them there is also a history of sore throat, but this may not be apparent when the patient first comes under observation. The following is a case of this kind:—Femela,

age 6, said to have been taken ill with headache, sore throat, and a rash on the previous day. At the time of admission, the rash was present on the back, and was punctate in appearance ; the temperature 101° F., but the throat showed nothing. By the next day, the temperature had fallen to normal, and the rash quickly disappeared. She was kept under observation for 31 days, and no desquamation occurred.

In some of these patients there is, at the time of admission, definite faucial injection. Here the resemblance to mild scarlet fever is extremely close, the symptoms are just what one would expect to get, and possibly more than one member of the family may be attacked. Indeed, it may be impossible to distinguish between a non-infectious erythema, mild scarlet fever, and rubella, when the patients first come under observation. The points, to which attention should be paid, are the absence of sore throat in some of these cases, the irregularity of the symptoms (*e.g.*, the rash may appear at the onset, and the sore throat may not be noticed for two or three days), the slight degree of pyrexia, and its rapid return to normal within two or three days, and subsequently no desquamation.

In some instances, the punctate erythema may be the result of an enema administered about 24 hours previously. In order to differentiate them, attention should be paid to the absence of vomiting, sore throat, pyrexia, or other signs of the onset of an illness, and a history can be obtained that a soap-and-water enema has been recently administered.

Another cause, which may determine the occurrence of a punctate rash, are various septic conditions. Three such cases were observed.

The first was that of a woman who had been confined on the 4th November. On the 14th, a rash was observed on the chest, and, on the 16th November, she had an attack of shivering which was followed by rigors. There was, however, no sickness or sore throat. She was admitted, on the 17th November, with a punctate erythema involving the trunk, pain in the groin, and some swelling of the right leg. The temperature was elevated for 3 days, but the fauces appeared normal. She was kept under observation until the 30th November, and no subsequent desquamation occurred during this period. In the second case, the rash occurred in connection with a suppurating sore on the finger of the left hand in a child of 4 years. He was admitted on the same day as that on which the rash appeared (an erythema involving trunk and proximal parts of the limbs with ill-marked punctation). The temperature was $100^{\circ}6'$, but there were no other signs of illness. It fell to normal on the next day ;

and, although he was kept under observation for 29 days, no desquamation was observed. In the third patient, the rash was noticed on the day after an operation had been performed for suppurating femoral glands which were secondary to a sore on the heel. The temperature was 100.4° , but fell to normal the day after admission. There was some discharge of pus from the wound. He remained under observation for 25 days.

Cases which present less difficulty, are those in which the rash is devoid of punctation, and especially where it is unaccompanied by sore throat. They form by far the larger proportion of those, which have been included under the heading of erythemata. The following is a typical case of this kind:—R. W., age 4, said to have been taken ill, on the 17th March, with headache and a rash, and to have complained of sore throat on the 19th. She was admitted, on the 19th, with a general non-punctate erythema. There was no evidence of sore throat, and the temperature was sub-normal. The rash quickly disappeared and no desquamation occurred. She remained under observation until 6th April. In some of these cases, the rash is limited to the chest, or to the extremities, instead of being general in its distribution, besides being of a non-punctate character; and other symptoms, such as vomiting, general malaise, and sore throat, are usually absent, while the temperature is either normal or not above 99° F. at the time of admission. The remaining cases, which have been grouped under this heading, comprise (1) a case, in which the only feature was a circinate erythema, which had been present for one day, on the arms and thigh; (2) a patient, with an erythemato-urticarial eruption, which came out on the day of admission, and was said to have been preceded by sickness and a headache three days previously. No other symptoms were present during the three weeks which this patient remained under observation; (3) a patient admitted with some erythema around chilblains on her hands. This patient's sister had been in the hospital for an attack of diphtheria, and had been discharged a fortnight previously, and this may have led to the undue importance attached to the rash which was present. She had no other symptoms or illness; (4) three patients, in whom the only evidence of illness was the presence of an ill-defined erythema around lice bites. In all of them, the patient was admitted on the same day as that on which the rash was said to have been first noticed.

Tonsillitis.—The next largest group of cases is included under this heading. It forms about one-sixth of the whole, or a degree of frequency about half as great as the erythemata. The attacks generally were slight, the temperature only remaining elevated for two or three days after admission. The milder cases showed nothing beyond injection of the fauces, but, in the larger number, small discrete areas of exudation were present, the condition being that ordinarily described as follicular tonsillitis. In one patient, the attack was accompanied by slight faucial ulceration, but there was no case of quinsy among them. In one instance, there was a history of a rash having been present, and some patients showed an indefinite fleeting erythema at the time of admission. In by far the larger proportion, no rash could be seen, though it was stated to have been present on the day on which the patient was removed to the hospital. Four patients were reported to have had previous attacks of scarlet fever. In one case, the presence of desquamation on the hands appears to have been taken as corroborative evidence of the diagnosis of scarlet fever. This patient, aged 34, had a history of having had a headache and sore throat for four days followed three days later by sickness and a rash on the hands. Peeling on the hands had been observed on the day of her removal to hospital. In this case, the temperature was sub-normal when first seen; there was no rash, but she still had evidence of a sore throat. The desquamation was limited to the hands and forearms, and appeared to be due to the irritation of soda used in her occupation of a washerwoman. It did not extend to any other part of the body, and had disappeared 10 days later.

Of the remaining patients, two were suffering from seborrhœic dermatitis, two showed marasmic desquamation, one after whooping-cough, one after bronchitis, and one after a crop of sudamina, occurring in the course of an attack of lobar pneumonia, one had an alveolar abscess, and had been the subject of scarlet fever two years before, and three were admitted in the acute stage of lobar pneumonia. In the last-mentioned, a pyrexial disease of sudden onset, with flushed face and dry tongue, apparently led to the diagnosis of scarlet fever. All three of them, however, had definite physical signs of consolidation in the lung at the time of their admission.

In 27 cases, the condition was so indefinite that no diag-

nosis was possible, and these have been returned as no obvious disease. They include (1) patients said to be desquamating after an illness which had occurred from ten days to six weeks previously, but in whom no desquamation could be found; (2) patients sent in on the occurrence of headache or vomiting apparently because some other member of the family was suffering from scarlet fever; and (3) patients, who were said to have had the ordinary symptoms of scarlet fever, but in whom neither rash nor sore throat could be discovered at the time of their admission. The temperature was usually normal or subnormal, but, in a few instances, it was as high as 99° F.

Two of the patients, under treatment in these special wards, developed scarlet fever after their admission to hospital. The first of these, a male, aged 10, undoubtedly contracted the disease either in the receiving room, or in the separation ward to which he was admitted; but, in the second case, the attack of scarlet fever began 17 days after his admission to the isolation wards. Very considerable care was exercised in the discharge of these patients in view of the fact that a diagnosis of scarlet fever had been made in each case by another medical practitioner before they came under observation. The average residence for the patients, diagnosed as erythema, tonsillitis, and no obvious disease (which form by far the larger proportion of the non-infectious ailments), is shown as under, together with the average stay at home prior to their admission.

Disease.	Length of Stay in Hospital.	Average Stay at Home prior to Admission.	Period of Disease when discharged.
Erythema - - -	23·3 days.	3·5 days.	26·8 days.
Tonsillitis - -	21·3 „	3·6 „	24·9 „
No obvious disease -	20·1 „	6·7 „	26·8 „

In a small number of the cases, the diagnosis was a matter of difficulty, *i.e.*, it was very difficult to be sure whether the patient had had a very mild attack of scarlet fever, or whether the illness had been of a non-infectious nature. It is of interest to note that two subsequent cases of scarlet fever occurred in the house, to which one of these patients had been discharged, after intervals of 10 and 11 days respectively.

The primary case was admitted on the second day of disease, and discharged after a stay of 23 days with the diagnosis of tonsillitis. The child, however, was not sent back to the hospital for further isolation, so that, presumably, it showed no evidence of infectivity when the other cases occurred. With this exception, no subsequent cases of scarlet fever were reported in the houses to which these patients were discharged.

In a disease, such as scarlet fever, in which a certain number of very mild and indefinite attacks occur, it is impossible to avoid the removal to hospital of some patients, who do not subsequently furnish corroborative evidence of having had the disease. From a public health point of view, it is of importance that all possible cases of scarlet fever should be under observation. The patients, with mild attacks, are soon well, and able to return to school, and, if brought into contact with susceptible children, may be the source of many other cases. Among the better classes it may be possible to provide the necessary accommodation in their own houses; but among the poor—where the whole family only occupies one or two rooms,—this cannot be obtained, and it became inevitable to have recourse to the hospital. The increase, which has taken place of recent years, in the proportion of patients removed to hospital—as compared with the number of notifications—has undoubtedly led to an increase in the number of the doubtful cases for which hospital provision of a special kind should be made: no patient being put into a general fever ward unless, at the time of admission, the evidence of scarlet fever is quite conclusive. For such patients, isolation accommodation, such as the hospital at Walthamstow (single rooms opening on to an outside corridor and separated by glass partitions), is eminently suitable. Under such conditions, the risk of the patient contracting scarlet fever in hospital is practically non-existent, while the glass partitions prevent the loneliness which is so disagreeable to small children who are kept in rooms by themselves.



ON THE DIFFERENTIAL DIAGNOSIS BETWEEN THE RASHES OF SCARLATINA, DIPHTHERIA, AND OTHER SKIN ERUPTIONS.

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SCARLATINIFORM rashes of different degrees of intensity are not uncommon, and their diagnosis from the eruption of true scarlatina often presents a problem of the greatest difficulty. In some cases—rarely, it is true—the whole train of symptoms of moderately severe scarlatina may be imitated so closely that, even taking everything into consideration, it is impossible to arrive at a definite conclusion; while, in others, it is only with very mild or atypical cases of scarlatina that confusion can arise.

Nevertheless, if it is borne in mind that it is not uncommon for children to be brought to the out-patient department with peeling palms, and for the physician to elicit no history of illness, and perhaps none of a rash, and for the case to turn out in spite of this to be true scarlatina, the intense difficulty presented by these fugitive erythemata will be more adequately recognised.

It is beyond the scope of this article to attempt to give a complete account of the differential diagnosis of scarlatina, a matter which is dealt with by others in this number, and I have therefore thought it wiser to limit myself to short descriptions of those rashes which may easily give rise to doubt.

In order to introduce some kind of method, the following provisional classification is offered:—

(1) Eruptions occurring in infectious diseases other than the well-known eruptive fevers:—

Erythema of diphtheria.

Erythema of influenza.

Erythema infectiosum (scarlatinoid of some writers).

(2) Eruptions of sepsis and other infective processes:—

Erythema after operation, confinement, or trauma
(surgical scarlatina).

Erythema accompanying tonsillitis.

Erythema accompanying gonorrhœa.

(3) Eruptions from use of drugs, etc. (these are innumerable and only a few of the more important are noticed):—

Erythema from enemata.

Erythema from antitoxic serum.

Erythema from belladonna, quinine, mercury, salicylic compounds, and veronal.

(4) Eruptions of unknown cause:—

Erythema scarlatiniforme.

Erythema scarlatiniforme recidivans.

The Erythema of Diphtheria.—The question of erythematous rashes in diphtheria has become somewhat more complicated by the introduction of the antitoxic serum, which is itself capable of giving rise to an erythematous eruption.

I have, however, seen a few instances of scarlatiniform eruption in cases of diphtheria in which the antitoxin had not been administered. In all these cases, there was present a bright red but perfectly even flush on the skin, showing no punctate arrangement, and followed by no peeling. The rash appeared early on the chest, but whether the root of the neck was first involved could not be ascertained. No further rise of temperature occurred with the appearance of the rash, which came out on the second to the sixth day of illness, and no particular state of the tongue was observed.

The Erythema of Influenza.—This is of more common occurrence, but, in making the diagnosis, care must be taken to exclude the possibility of a drug eruption. Hamilton, who published a series of cases, states that, although the rash was scarlatiniform, it was not followed by desquamation. In the epidemic of 1891-92, I had the good fortune to see several cases of erythema occurring in the course of influenza, the rash coming out in the first few days of illness. Unlike Hamilton's cases, there was marked peeling in some of mine, and one woman shed almost entire casts of her hands. I have seen no cases in recent years, but I should

be inclined to think that the diagnosis could hardly be made by the rash itself.

Erythema Infectiosum—Scarlatinoid—"Fourth Disease (?)."—These appear to be the same disease, but the description is not very definite, and I cannot claim to have observed any cases myself.

The disease begins with catarrh of the nose, and redness of the mucous membrane of the mouth and pharynx, with grey patches on the tonsils. There is slight itching, with headache and fulness of the face, but no conjunctivitis. The rash begins on the cheeks, respects the circumoral region, and is scarlatiniform in character. The temperature is raised to about 102° F., but falls to normal in 24 hours, and the rash rapidly fades. The tongue takes on the strawberry appearance, and there is some colic and diarrhoea for eight or ten days. Desquamation, which is branny on the body and lamellar on the hands, follows. The epidemic occurs chiefly among children, but some adults are affected. No deaths or complications occur.

Surgical Scarlatina.—True scarlatina may occur in a patient after operation, and in such case runs the ordinary course. More frequently, however, under the name of surgical scarlatina, was described what is now recognised as a septic poisoning. The rash, in these cases, almost always begins around the operation wound as an evenly red flush. From this point it spreads centrifugally for a time, and then breaks out symmetrically with a special tendency to affect the extensor surfaces. No brown discolouration of the flexures of the elbows is present, and sore throat is by no means a usual accompaniment, though it may be present.

Erythema with Tonsillitis.—This form is particularly likely to give rise to anxiety, owing to the fact that the early and severe involvement of the throat renders the diagnosis extremely difficult. Two illustrative cases are therefore given.

In the first case, I was called in by an extremely able practitioner to see a nursemaid suffering from a scarlatiniform eruption.

The attack began with severe sore throat and great tonsillar swelling, and the temperature was found to be 103° F. Twenty-four hours later, a rash was observed first on the

throat and neck and later on the limbs. I had the good fortune to see her one day after the appearance of the rash, when the diagnosis was considerably easier than it must have been at first. The rash did not entirely cover the arms, but left off with a very sharp margin about the middle of the forearms. That on the chest was beginning to fade, and left no brownish stain. The tonsils were greatly enlarged, and the crypts were heavily plugged with a whitish pulp; the palate and fauces were not greatly reddened; the tongue was partly covered with a thick white fur, but was beginning to clean, and showed no stripping of the epithelium.

We made the diagnosis of septic tonsillitis and erythema, and the girl was not isolated. There was no subsequent peeling, and no spread of infection to others.

The second case was only recently under my care at the Great Northern Central Hospital. The patient, a girl of sixteen, spent last Whit Monday on Hampstead Heath, and apparently caught a chill. On the Saturday following, she felt suddenly ill, and became feverish with severe sore throat, and the same evening she noticed that her arms were very red. On the following morning, the neck was also observed to be red, but I think this may have escaped notice on the previous evening. On the following Wednesday (the fourth day after onset) she came to the hospital, when her condition was as follows:—The patient looked ill, and the temperature was found to be just over 100° F.; the chest, back, and arms were covered with a red, punctate rash showing rather more erection of the follicles than is usual with true scarlatina. There was marked yellowish staining on pressing out the hyperæmia, and there was considerable browning of the flexures of the elbows. The face, however, was desquamating freely, *especially around the mouth and chin*. The tonsils were red and much swollen, the tongue was slightly furred, but not at all “strawberry” in type.

Two medical men, who were with me, suspected scarlatina, but it was pointed out that the development of peeling before the fading of the rash was strong evidence against it. A week later the body was also peeling, and there was no spread of infection to others.

These two cases illustrate slightly different types of

eruption, in one case, the sharp demarcation of the eruption, and in the other, the precocious peeling rendering aid in the diagnosis.

Gonorrhœa.—Many cases have been published of rashes in connection with gonorrhœa, and naturally, in some cases, the rash has been scarlatiniform in character. As a rule, however, it is more scattered, and has a tendency to develop small pustules (which might be confused with sudamina in scarlatina), from some of which the gonococcus has been identified. There are of course other eruptions of gonorrhœa, such as palmar hyperkeratosis ; but these do not enter into the question under consideration.

Eruptions from the Use of Drugs, etc.—Under this heading, *enema* rashes appear to be logically grouped, as it seems certain that the determining factor is the quality of the soap used, sodium soaps having a much greater tendency to cause the eruption than those made with potassium.

The rash is, as a matter of fact, much more often morbilliform than scarlatiniform, and comes out, in most cases, first on the buttocks, and then on the extensor surfaces of the limbs. There are no symptoms in the throat or on the tongue, and there is usually but little difficulty in making the diagnosis, if the possibility of this cause is borne in mind.

Serum Rashes.—It should be first of all remembered that, of all forms of antitoxin eruption, the scarlatiniform is the rarest. It usually begins around the site of injection, instead of at the root of the neck ; there is no rise of temperature, if this has previously been normal ; there is slight itching, and miliaria may occur, if the patient has a sweaty skin.

Oppenheim and Loeper state that the diazo reaction in the urine is a distinguishing point between the serum rash, and scarlatina, being absent in the former and present in the latter. Further investigations have, however, shown that the reaction is inconstant in scarlatina, and a positive reaction alone, therefore, can have any diagnostic significance.

Of the other drug eruptions, that of *belladonna* most closely imitates the rash of scarlatina viewed from the skin aspect alone. The eruption begins at the root of the neck and upper part of the chest, is markedly punctate, spreads to the face, leaving a striking circumoral pallor, and finally

generalises with very indistinct margins. There are no other symptoms of scarlatina, and the rash is not followed by desquamation, so that, as the drug is not one that is often taken on the patient's own initiative, difficulties of diagnosis are not common.

Perhaps, in spite of its less close imitation of the cutaneous symptoms of scarlatina, the eruption of *quinine* is most likely, to give rise to difficulty, since the drug is used so indiscriminately by the public.

The following is a characteristic case described by Korybut. After 15 grains of quinine, the patient had a rigor with vomiting and headache, and the temperature rose to 104.6° F. At once a burning scarlatiniform rash and sore throat developed. The tongue was heavily furred, with red edges, the tonsils red and swollen with a grey patch on the right (this was afterwards found to be syphilitic), and the soft palate was diffusely red.

On suspicion of quinine, the patient was persuaded, after recovery, to take a second dose of $10\frac{1}{2}$ grains of the hydrochlorate of quinine, and, in one hour, all the symptoms recurred. These cleared up again in three days, without subsequent desquamation (though desquamation may occur).

Eruptions from *mercury* are comparatively rare, and, when they occur, follow the type of erythema scarlatiniforme described below. They are also accompanied by symptoms of severe mercurial poisoning.

Veronal, the *salicylic* compounds, and occasionally *potassium iodide*, give rise to scarlatiniform rashes (as, indeed, on rare occasions, do most other drugs), but they all show a marked tendency to attack the extensor surfaces of the limbs instead of the root of the neck.

Erythema scarlatiniforme and erythema scarlatiniforme recidivans are eruptions of unknown causation, possibly of intestinal origin. They both show the same peculiarity of desquamation beginning before the rash has faded. The throat is not usually so severely affected as in scarlatina; the circum-oral pallor is not a marked feature; and, in my experience, the rash excites more papular elevation of the follicles. Of course the history of repeated attacks would be of assistance

in the relapsing form.

To sum up the peculiarities of the skin eruption only in scarlatina, I would lay stress on the following points:—

(1) The rash invariably appears first on the root of the neck.

(2) Where not absolutely universal, the edge of the eruption gradually fades off into the normal skin. The tip of the nose and the circumoral region are never affected.

(3) The follicles may be slightly erected, but there is no true papule formation; on the other hand, the early eruption shows that the follicles are the chief seat of congestion.

(4) A yellowish stain appears when the hyperæmia is dispelled by pressure, and browning of the flexures of the elbows is almost invariably present.

(5) The backs of the hands and the sides of the fingers are generally affected when the rash is fully out.

It is probably not necessary to state that I do not wish to imply that diagnosis by the rash alone is often possible or ever justifiable. It has rather been my aim, in this paper, to draw attention to certain points, which may help in the diagnosis, if taken into consideration with the other obtainable evidence.

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OBSERVATIONS BEARING ON THE CONVALESCENT STAGE OF DIPHTHERIA.

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THE diphtheria convalescent, should the attack have been a severe one, is liable, for several weeks after the throat is healed, to certain developments which are apt to retard recovery, even to the extent of seriously jeopardising life. This is the case, though the acute stage of the disease may have been passed without a hitch, and the general aspect of the patient have become such as to lead anyone, unfamiliar with the disease, to indulge in the most favourable anticipations of recovery.

By attention to the appearances presented during the early acute stage, however, it is usually possible to forecast, with some measure of accuracy, the chances of the attack proving fatal, or, at any rate, to form an opinion as to whether, or no, it is likely to be complicated by one of the developments I refer to, viz.:—cardiac depression or paralysis.

The extent to which one is able to specialise in prognosis, or, in other words, to narrow down the forecast to a question of degree, is purely a matter of experience. For all practical purposes, it may be asserted that speedy death from toxæmia in the acute stage, progressive and fatal cardiac failure, or a mere temporary cardiac depression, characterised by feebleness, irregularity, or, perhaps, undue frequency or slowness of pulse, are representative of different grades of severity of attack, just as they are expressive of varying degrees of tissue damage resulting from the diphtherial intoxication.

The same relation holds good in respect to the nervous sequelæ of diphtheria, though exceptions are more frequent. It is true that, by careful attention to the local appearances presented by the throat and nasal passages during the acute stage of the attack, we are usually enabled to estimate with some confidence the likelihood of paralysis supervening, should the patient survive the phase of cardiac depression, which is so apt to appear during the early convalescent stage of a bad

attack, and lead to a fatal termination; and, moreover, it is usually possible, in cases of less severity, to prophesy, with some measure of success, whether the paralysis is likely to be widely distributed and prolonged, or, on the other hand, limited in extent and transient. So much, however, depends upon the localisation of the nervous lesion, that any anticipations we may have formed as to the ultimate danger to life, are liable to be upset. A comparatively slight affection of the bulbar centres, or of the fibres emanating from them, is infinitely more serious than a relatively complete and widespread degeneration affecting the peripheral nervous system.

It is a general rule, to which there are but few exceptions, that paralysis, which may be described as bulbar distribution, involving interference with the act of deglutition, laryngeal movements and sensibility, and coupled, as it often is, with weakness of the diaphragm or other respiratory muscles, is rarely seen, except as a sequel to a severe attack. Admitting, then, the fact, which must be evident to all, who have had extensive opportunities of studying the disease, that a direct relation exists between severity of attack in diphtheria and the subsequent development of complications affecting chiefly the heart and nervous system, which menace the safety of the diphtheria convalescent, it is desirable to examine, in some detail, those factors, observable during the acute stage, which make for severity, and from a consideration of which valuable assistance may be derived in respect to prognosis and treatment.

The factors, which chiefly influence the prognosis in any case of diphtheria, are six in number. Four of these may be regarded as incidental to the disease, and two as special to the patient.

- (1) Situation, extent, persistence, and character of the exudation.
- (2) Degree of glandular involvement.
- (3) Hæmorrhagic tendency.
- (4) Albuminuria.
- (5) Age.
- (6) Time of coming under treatment (antitoxin).

(1) When the *larynx*, *trachea*, and *bronchial tubes* are the seat of disease, the condition is, of course, attended with its

own particular risks. Apart from the direct danger to life from laryngeal obstruction, the possibility of extension downwards of membrane into the smaller tubes, with consequent cyanosis and collapse of certain areas of lung, or the advent of broncho-pneumonia, must always be borne in mind, especially in very young subjects.

Assuming the patient to have escaped these dangers, recovery in the laryngeal form of the disease is usually complete, and there is little risk of subsequent complication. It is noteworthy that, in severe diphtheria, the respiratory tract is rarely invaded. Most cases of diphtheritic croup, on the other hand, show some, though slight, involvement of the fauces, though the exudation is commonly limited to the tonsils. Occasionally, a weakness of the vocal cords may be detected at an early date, but this "precocious paralysis," as it has been not inaptly termed, like that which sometimes affects the palate at an early stage after a faucial attack, though apt to be prolonged, is rarely a source of danger. It is probably the result of local myositis.

Primary *nasal* diphtheria shows but little tendency to extend, and the instances are very few in which the membrane spreads beyond the nasal passages. The condition is attended with little or no virulence, and is very rarely followed by either cardiac or nervous disturbance. The patient is not ill, and more often than not, the affection is only discovered in the course of an investigation into the source of other cases.

It is very different, however, when the nasal fossæ are secondarily involved as the result of extension from the fauces. Such extension is a very important factor in a faucial case, and materially affects the prognosis.

When, as is the case in most attacks of diphtheria, the *fauces* are the primary seat of invasion, the severity of the condition may vary within the widest limits, and here the special characters presented by the exudation afford a valuable indication as to the likelihood of subsequent developments. If the amount of membrane is large, it implies a large amount of toxin formation. If, on the other hand, the area involved is small, but little toxin is formed, and the tissue changes, resulting from its circulation in the blood, are comparatively slight and unimportant. Bearing in mind the well-authenti-

cated facts that the toxin is formed locally at the seat of disease, and that the presence of membrane constitutes a trustworthy criterion of the specific local process, it is only reasonable to expect that a small area of membrane, if unduly persistent, might be associated with the production of just as much toxin as a larger one of less duration.

That the foregoing assumptions are justified is supported by clinical experience. So much so, indeed, that it may be stated, as a general law to which there are few exceptions, that in diphtheria *the gravity of the attack, whether exemplified in the immediate danger to life in the acute stage of the disease, or in a later liability to paralysis or cardiac failure, is directly proportional to the extent and persistence of the exudation.*

The chief exceptions I refer to are the purely nasal cases, and those in which the disease is limited to the air passages. These forms of diphtheria are rarely toxic in character, or followed by complications.

Valuable evidence, too, in respect to prognosis, is yielded by the character and appearance of the exudation itself in faucial cases. In mild attacks the exudation is usually thin, and but little raised above the surface. It is apt to be greyish or dirty-white in tint, with a clearly defined margin, and frequently presents a dull-looking, or quasi-necrotic appearance. In mild attacks, in which the exudation is limited to the tonsils, it often occurs in isolated patches.

In striking contrast with the above is the case in which the exudation consists of a thick, white, glistening, gelatinous, or sometimes fibrous-looking membrane. This stands out prominently, often with incurled edge, above the swollen, pink, and obviously œdematous mucous membrane. In such cases the false membrane often involves the uvula as well. This it ensheathes, as with the finger of a glove, and spreading over the anterior faucial pillars and velum, in certain instances may even encroach on the hard palate. In such cases the membrane tends to become discoloured before it is shed as the result of putrefactive changes in its substance, and the breath is rendered horribly offensive. Since putrefaction of the exudation *in situ* is characteristic of thick formations, marked fœtor of the breath comes to possess a special prognostic significance.

A person suffering from this type of attack, if not carried off in the acute stage of the disease from the intensity of the toxæmia, has little chance of escaping subsequent complications. More often than not he will succumb to fatal cardiac failure during the course of the second week, or a little later, but, if fortunate enough to surmount this peril, will almost surely suffer from diphtheritic paralysis of some degree at a later period of convalescence.

(2) The occurrence of much glandular swelling in faucial diphtheria is another indication of severity. In grave attacks it is the deeper glands lying beneath the sterno-mastoid which are especially involved, rather than those behind the angle of the jaw, or in the submaxillary region. As a result the contour of the neck is visibly broadened. This deep glandular swelling, together with the attendant œdematous infiltration of the cellular tissue, gives to the neck a very characteristic appearance (*cou proconsulaire*). This was recognised by French writers, so far back as the middle of the last century, as an indication of severity. Occasionally, in lethal attacks, in addition to a general enlargement of the neck, puffy infiltration of the cellular tissue may be detected, even below the level of the clavicle.

(3) The occurrence of hæmorrhage, either locally, from the affected mucous surface, or, more important still, from the kidneys, or in connection with the skin, is an important factor in prognosis. Bleeding from the throat or nose usually comes from the edge of the exudation, and, in a sense, may be regarded as traumatic in origin, whereas hæmaturia or hæmorrhage into the tissues away from the local process is a sign of profound toxæmia.

A tendency to bruising of the skin where the child has been handled, or the formation of a subcutaneous extravasation at the site of an antitoxin infection, is not uncommon in grave attacks. This, though undoubtedly a serious sign, does not necessarily denote a fatal issue, but I have never once, in the course of more than 20 years' experience of diphtheria, seen a patient recover in whom definite purpuric spots appeared in the skin as a primary and independent phenomenon.

(4) Albuminuria in diphtheria occurs in more than 20 per cent. of faucial cases. Unlike the albuminuria of scarlet fever,

it appears during the acute stage of the disease, and the amount is usually proportionate to the gravity of the attack. In most bad cases the quantity of albumin in proportion to that of urine passed is high, especially if there is any degree of suppression. The albuminuria is not due to nephritis, but to degenerative changes in the renal parenchyma, the result of toxic irritation. It rapidly disappears with the onset of convalescence, though it is liable to reappear in considerable amount in association with cardiac depression, especially if the vomiting persists, and the urine becomes diminished in quantity. Very few cases of diphtheria, which develop paralysis, fail to show albuminuria at one time or another, though it often clears up before the paralysis makes its appearance.

(5) The age of the patient exerts a twofold influence on the prognosis. Young children show but little resistance to the poison of diphtheria, beyond which, the younger the child, the greater is the likelihood of the disease affecting the air passages and proving fatal from respiratory obstruction. Children of tender years succumb more readily to the immediate effects of the toxæmia, the cardiac depression of early convalescence is usually progressive, and they are more liable to diphtheritic paralysis than older children or adults.

(6) The time of coming under treatment by antitoxin, which, in a sense, may be regarded as an indication of the extent to which the tissues have been damaged before the toxin is rendered inert, is of paramount importance in prognosis. Not only does it largely influence the chances of the attack proving directly fatal in the acute stage, but it appears to be an equally important factor in determining whether, or no, the convalescent stage will be interrupted by complications.

Evidence of the most convincing character as to the direct effect of early treatment with antitoxin upon fatality, is yielded by the records of the large fever hospitals. Those published by Dr. MacCombie for the Brook Hospital are most to the point, inasmuch as the cases, numbering many thousands, are grouped according to the day of disease on which the treatment was commenced. The tables referring to the last 10 years¹ show that, of patients who received

¹ *Reports of the Metropolitan Asylums' Board, 1895-1907.*

antitoxin within the first two days of attack, the death-rate was only 3·59 per cent., but that, with delay in commencing the treatment, the mortality progressively increased until it reached 18·01 per cent. in those to whom antitoxin was not given until the fifth day, or later.

In an attempt to illustrate the effect of early treatment by antitoxin on the subsequent development of complications, we are unable to rely to the same extent upon statistics. So equivocal are apt to be the manifestations of cardiac disturbance, and oftentimes so slight and transient in their nature, that, without almost constant attention on the part of the medical attendant, they may escape detection altogether.

Moreover, in respect to the incidence of paralysis, the issue is apt to be confused by the fact that many patients treated with antitoxin are saved for paralysis who would certainly have died had they not received it. Admitting, then, as we must, that statistics cannot tell us all there is to know about the good effects of antitoxin, the importance of its early administration, in controlling the incidence and severity of the later developments of the disease, is a fact which is patent to all who have had much experience of diphtheria.

Having now discussed the chief indications which make for severity during the early acute state of diphtheria, from a consideration of which, in patients who survive, we are justified in forecasting the likelihood of further developments during convalescence, it remains to say a few words about these developments, and the extent to which they may be expected to influence the outlook.

The complications I refer to are two in number, viz., disturbance of cardiac function and paralysis, using the term paralysis in the wider sense usually accepted in connection with diphtheria to include both motor and sensory affection.

Since both conditions are the direct outcome of degenerative changes set up in the tissues by the poison circulating in the blood, it is only natural to expect that the severity of the clinical manifestations would be largely proportionate to the intensity of the original toxæmia. Assuming that due care has been exercised in the management of the case, this is found to be perfectly true in practice, but regard must be had to

the age of the patient, and the time of coming under treatment.

The degree of circulatory disturbance varies within the widest limits in different cases. In very mild attacks, more often than not, such disturbance is characterised by a mere abnormality of pulse of a slight and purely temporary nature, unaccompanied by any signs in the heart which can be detected on physical examination. A slight weakening of the pulse is common, but is usually very difficult to detect in young children.

Irregularity of pulse, on the other hand, is a noticeable sign, as also an occasional intermission. It is often met with during the early weeks of convalescence, even after a comparatively mild attack, and should serve as a signal for caution.

Rhythmical disturbance of pulse is apt to be of temporary duration, though usually tending to recur, the condition alternating with periods during which the pulse is perfectly regular. For this reason, if the patient is not frequently examined, the symptom may easily escape detection. Perhaps the most characteristic sign, and one which constitutes trustworthy evidence of cardiac depression, is a disproportion between the pulse rate and the temperature. A pulse rate of 120 or more with a normal, or possibly sub-normal, temperature, during the early weeks of convalescence from a severe attack, even though the child may appear perfectly well in all other respects, is by no means uncommon. It is a sign of great moment, however, as it denotes the presence of heart-weakness which is liable to culminate in fatal cardiac failure.

Fortunately, in the majority of cases, which might be classed as severe, the condition does not progress to this extent under careful treatment, but should vomiting set in, the outlook becomes grave, as it points to progressive, and usually fatal failure. It is in cases such as these, in which definite evidence of cardiac depression is apparent, that the indications present during the early stage of the attack to which I have already referred, are so helpful in prognosis.

In rare instances the converse sign, tachycardia, is met with. The pulse-rate falls to 140, or even lower. In such cases the condition is at first usually unaccompanied by any general symptoms suggestive of cardiac depression, but, in the course of a day or two, the patient is apt to become restless and complain of substernal oppression.

Contrary to the view which, I believe, is held by some, my own experience of diphtheria has led me to regard, with special apprehension, the occurrence of "slow-pulse" during early convalescence in the case of adults and older children.

In the large majority of cases showing signs of enfeebled heart, some dilatation of the organ can be made out, though the dilatation is frequently of a very temporary character. It is most pronounced in the left ventricle, as evidenced by an outward displacement of the apex beat, often to the extent of half an inch or so beyond the nipple line, while some ventricular impulse can usually be felt a little farther out still by careful palpation. Dilatation murmurs are occasionally heard, and the cardiac sounds are weakened. This is especially true of the first sound, which tends to become short, soft, and often reduplicated. A feeble "cantering" rhythm thus established is a sign of serious import.

The normal spacing, too, is apt to be disturbed, chiefly because the pause following the second sound, normally the longer, is shortened. Equalisation of the two intervals thus occurs, and the rhythm assumes a "tic tac" character. This peculiarity of spacing is a trustworthy sign of cardiac weakness, and is most often to be detected when the pulse-rate is high in relation to the temperature. The extent, to which life may be considered to be endangered, in view of the presence of any of foregoing signs, may, to a large extent, be gauged by a consideration of the factors characterising the early stage of the illness, but in all but the gravest cases the result will be largely influenced by the treatment adopted when signs of heart weakness are first detected. For this reason the signs I have cited must be very carefully watched for. Far and away the most important factor in the management of the case during early convalescence is rest, absolute physical rest, and so far as possible, mental rest as well.

By insisting on complete recumbency, not even allowing the patient to raise himself in bed for food, medicinal applications to the throat, use of the bed-pan, or changing of the linen, by forbidding even the slight exertion involved in reaching out for, or lifting, any article from the side table, and by protecting him from every sort of excitement, in the large majority of cases, the convalescent can be successfully tided

through the period of cardiac depression. This usually commences during the early part of the second week of illness and extends to the fourth or fifth, and even later in certain cases.

Unfortunately, in those very grave attacks in which the throat is covered with thick and foetid membrane, with running nose and swollen neck, especially if a hæmorrhagic tendency is evinced, or the patient has been late in receiving antitoxin, the rigid enforcement of rest and the exercise of the most scrupulous care on the part of his attendants will probably prove ineffectual in arresting the course of progressive, and ultimately fatal, cardiac failure.

In the majority of such cases death occurs in the latter half of the second week, though signs of circulatory depression, if looked for, will have been apparent several days.

The combination of symptoms indicative of "acute cardiac failure," the condition commonly, though quite erroneously, spoken of as "cardiac paralysis," and representing, as it does, the culminating point of a progressive depression of the heart's function, constitutes a clinical picture which is very striking, and is never likely to be forgotten by anyone, who has once seen it, and tried to combat it in practice.

The onset of cardiac failure is heralded by one or more of the indications of circulatory depression, which have already been described, but to these is superadded a symptom of great importance, viz., vomiting. This occurs at first as an isolated act, usually as a sequel to feeding. After an interval of a few hours the vomiting recurs, and soon becomes persistent. The pulse is more rapid than it should be, while the temperature is normal. Restlessness and facial pallor gradually supervene, together with sighing respiration, præcordial oppression, and that feeling which the Germans aptly describe by the term "air hunger." Older patients are often much disturbed about this stage by a vague consciousness of impending danger. During the course of the second day, the symptoms in young children, as a rule, become much aggravated. The vomiting is now more frequent and defies all efforts at treatment, while every attempt to swallow a teaspoonful of water, or even a morsel of ice, ensures its immediate rejection, and the patient gets more and more exhausted by the frequent paroxysms of retching, which recur periodically, even though nothing

whatever may have been swallowed. The pulse, which by this time has become very rapid, thready, and, perhaps, irregular, may be almost or quite imperceptible at the wrist, and its strength on the two sides may be distinctly unequal.

The temperature is depressed, the extremities becoming colder as time goes on, and though the limbs may feel chilly and impart a sensation of clamminess to the touch, and the face be drawn and pinched, the patient usually complains of heat, and persistently throws off the bed-clothes.

The restlessness now becomes extreme, pain in the region of the heart or epigastrium, and occasionally severe cramps in the calves of the legs or elsewhere, are complained of, while the urine, which commonly contains a great deal of albumin, is excreted in gradually diminishing quantity. For some hours before death, there is usually complete suppression. As a rule, the liver is considerably enlarged, even to such an extent that its lower border may sometimes be felt below the level of the umbilicus. This sign is apt to be most pronounced in cases in which the end is unduly protracted. At this stage, a localised scarlatiniform rash often appears on the extensor aspect of the knees and elbows, a symptom which, on the authority of J. D. Rolleston, was first described by Marfan. The rash is frequently somewhat petechial.

The patient usually retains his clearness of mind throughout, or, at most, shows a tendency to wander. The end, as a rule, comes quite suddenly. Life, which for some time had been slowly ebbing away, goes out, as it were, like a flickering candle; the victim perhaps having been in whispered conversation with his nurse but a moment before, so sudden sometimes is the actual ending. This, however, affords no justification for the statement, which is by no means infrequently met with in the text-books, that death is liable to occur *unexpectedly* from sudden syncope in the course of diphtheria convalescence.

In a case, such as I have just described, following on an obviously grave attack of diphtheria, the signs of impending cardiac failure are, of course, so pronounced as to be unlikely to escape the notice of the least observant, but even after attacks which might be classed as moderately severe, where, as the result of the patient having been injudiciously allowed

to get up, instead of being kept in bed, a risk of dangerous syncope has been incurred, such syncope is always preceded by signs of cardiac depression. These should be apparent to any careful observer, and enable him to take steps calculated to lessen the likelihood of its occurrence.

"To be forewarned is to be forearmed," is very true in connection with diphtheria, and the occurrence of a case of "unexpected fatal syncope" in circumstances in which frequent observation is possible, and obedience to instructions can be secured, can only be regarded in the light of a grave reflection on the medical attendant.

That an actual weakening of its muscular wall is directly responsible for the failure of the heart to fulfil its task is, I think, beyond all question. The determining cause is the same, differing but in degree, whether the effect takes the form of a slight and transient depression, or a grave and progressive failure of function which is incompatible with life.

Dr. L. S. Dudgeon has clearly shown, in the course of an exhaustive examination of the tissues in diphtheria,¹ the presence of advanced fatty change in the heart muscle of persons dead of the disease. Although the change he describes was more diffuse, and the fat granules finer, in the hearts of those who were carried off in the acute stage of the disease by the intensity of the toxæmia, the fatty change was most developed in those who died in early convalescence from cardiac failure. Further evidence of the selective action of diphtheria toxin on the heart muscle was obtained by observing the results of its injection into guinea-pigs.

In the experimental animal, Dudgeon found well-marked fatty change commencing in some of the cardiac fibres within 12 hours after inoculation, and in the diaphragm even earlier. By the use of the stains, he recommends the degree which this deterioration of heart muscle reaches in really severe diphtheria can be easily demonstrated. Even osmic acid will in some instances prove effective.

With the help of this stain, I successfully demonstrated, some twelve years ago, the presence of commencing finely-diffused fatty change in the heart muscle of a child who had died on the third day of very severe faucial diphtheria. It

¹ *St. Thomas's Hospital Reports*, Vol. XXXIV.

is no matter for surprise that, in such circumstances, the resistance of the cardiac wall should weaken, or that it should prove wanting in contractility. To speak of the resulting clinical condition, however, as "cardiac paralysis," as is so often done, is no less irrational than to apply the term to a case in which the organ fails to contract as a result of its infiltration with cancer.

Now, of the other special complication to which the diphtheria convalescent is liable, viz., paralysis, interesting and important though it is, I propose to speak very briefly. The subject of diphtheritic paralysis has been so well and exhaustively dealt with by Dr. J. D. Rolleston in a former contribution to *THE PRACTITIONER*,¹ that I will only touch on certain points which seem to be deserving of emphasis.

In view of the fact that the paralytic phenomena, like the cardiac, are but the clinical expression of tissue changes of a degenerative character directly induced by the original toxæmia, it might be expected that the extent and severity of the paralysis would, in like manner, bear some relation to (a) the type of the original attack; (b) the susceptibility of the patient, and (c) the amount of damage the tissues might be expected to have sustained before being brought under the protective influence of antitoxin.

The supposition is borne out in practice, and it may be asserted with confidence that those factors, which I have specified as capable of affording a forecast as to the likelihood of cardiac developments, are equally valuable in this connection.

There is an outside factor, however, which exercises a disturbing influence on this relation, and that is, the amount of care which is exercised in the management of the case. If, after an attack of moderate severity, the patient is allowed to get about too early, the risk of paralysis developing is materially increased; and further, if the case is not very carefully watched, and, on the slightest indication of nerve disturbance, such as a slight palatal weakness, or an alteration of the knee jerks, not immediately put to bed and kept there, the paralysis is very likely to increase, and even become extensive.

Failure to realise the importance of protracted rest would appear to partially explain the conflicting views which have been expressed in respect to the incidence of diphtheritic

¹ *THE PRACTITIONER*, November and December, 1904.

paralysis. But whether this be so, or no, the astonishing statement that post-diphtheritic paralysis occurs at least as frequently after mild attacks as after severe ones survives even yet in certain medical text-books.

So far from the truth is this, that any one really familiar with diphtheria is enabled, from observation of the original attack, to predict with some degree of confidence the chance of paralysis supervening, and, in many instances, even to make a guess at its severity and probable distribution.

Although, as is well known, diphtheritic paralysis is not often destructive of life, the large majority of cases ending in complete recovery, the possibility of a dangerous development should always be borne in mind.

The chance of the condition becoming serious is chiefly determined by the distribution of the paralysis, and this again is somewhat closely related with the time at which it makes its appearance.

Of the structures liable to be involved, the palate and eyes are most often affected, the ciliary muscles suffering a great deal more often than the external ocular group, or the levator palpebræ, though a certain degree of incoordination of the ocular movements may often be detected after attacks of moderate severity.

The palatal and ocular paresis (the loss of power in the post-diphtheritic affection being rarely complete) is not infrequently associated with loss of the patellar reflex and disturbed sensation in the lower extremities, as evidenced by a feeling of numbness, tingling, or "pins and needles" in the feet. Next to affection of the palate and eyes, these are the manifestations of disturbed innervation which occur most frequently, and should the attack of diphtheria have been a mild one, and the case have been carefully treated, the paralysis rarely extends to other parts.

The symptoms described above usually appear during the course of the third or fourth week, the eyes in most instances being the last to be affected.

After severe diphtheria, on the other hand, the distribution of the paralysis may be very much wider. Its appearance, too, is usually later. In those unfortunate and tedious cases, in which, as the result of weakness of the various groups of

muscles in the neck, trunk, and limbs, the patient is reduced to a state of complete helplessness, the onset of the paralysis is commonly delayed until the sixth or seventh week of illness. At about this time, too, the case is apt to be complicated by involvement of the larynx and pharyngeal constrictors, and should the diaphragm fail as well, as is often the case, the condition becomes one of considerable danger.

The symptoms denoting the onset of laryngo-pharyngeal palsy are quite characteristic.

A gradually increasing difficulty in swallowing food results in the entrance of some of it into the larynx on every attempt at swallowing. This may give rise to attacks of choking unless great care is exercised in the feeding, for owing to paresis of the adductor muscles of the larynx, which usually accompanies the weakness of the pharyngeal constrictors, closure of the rima glottidis cannot take place, or at any rate is very imperfect, and the patient is unable to expel the food and clear his larynx by an explosive act of coughing, as would immediately be the case under normal conditions.

For the same reason, saliva and mucus tend to collect in the larynx, and each respiratory act is attended with a "to-and-fro" mucous rattling with frequent ineffectual cough which is very distinctive. It is probable that coincident anæsthesia of the laryngeal mucous membrane contributes to this result, the normal reflex stimulus being wanting.

Weakness of the diaphragm is very prone to come on at this time, and materially adds to the danger. Not only is the blood imperfectly oxidised, as a result of inadequate pulmonary expansion, but there is always a risk of the super-vention of septic broncho-pneumonia, in consequence of the patient's complete inability to cough, and so clear the bronchial tubes of food and accumulated secretions.



THE TREATMENT OF SCARLET FEVER.

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[With Plate I.]

I HAVE been asked—and indeed it is also my desire—to discuss the treatment of scarlet fever, from the practical rather than from the scientific point of view. I write, of necessity, mainly from the standpoint of one who has to treat cases of this disease in bulk in an institution where skilled nursing is available, but any modifications, which may be necessary in private practice for the benefit of any particular case, will be referred to in passing.

I purpose dealing with the subject under the following heads:—

- (a) The uncomplicated cases of average severity.
- (b) The toxic cases (serum therapy).
- (c) The septic cases (local treatment).
- (d) Complications.
- (e) Convalescence.

(a) *The General Management of the Average Case.*—Possibly, the first question that will arise is whether the patient is to be treated at home, or to be sent to an isolation hospital. Without considering any factors of purely local significance—though these may often be of great importance—it is necessary to point out that it is not imperative to send every patient to hospital merely because he has scarlet fever. Where he can be isolated and treated at home without difficulty, there is no reason why he should be removed. Hospital treatment is generally indicated, however, under the following conditions:—

(1) Where the number of susceptible children in the house is large, or when these are suffering from marked debility, or from some condition which would tend to render the contraction of the disease a serious matter for them.

(2) When the presence of the patient in the house would involve social or financial disabilities to other inmates, such

as the closing of business premises, or marked interference with the education of other children. In practice, this point is usually determined by the wishes of the parents.

(3) Where the patient is seriously ill, and adequate nursing cannot be obtained. It is necessary, in this connection, to mention that it is exceedingly difficult in private practice to obtain a satisfactory nurse for a case of scarlet fever. Many of the nurses supplied for this purpose by private nursing institutions have not received any general training at all, but have merely spent some time in a fever hospital, and that too, it may be, in an institution where no real attempt is made to train nurses, and where they are not required to stay for a prolonged, or even for a definite period. While such nurses may be comparatively harmless under strict supervision in a hospital, they are usually quite unfitted for private nursing, or indeed for acting on their own responsibility at all. Of greater value than these are the nurses, who have received an adequate general training, and who have then spent a short period in a fever hospital. But this time is often far too short, and I do not think that anything less than a year is of much value. The best nurse for an infectious case is one, who has first spent at least two years in an isolation hospital, where attention is given to her professional education, and who has then received the usual period of training in a general hospital. My excuse for dwelling on this point is that it is difficult to exaggerate the value of the nursing factor in the treatment of scarlet fever.

It is hardly necessary to point out that every case should be notified to the Medical Officer of Health, and that failure to do so is an indictable offence under the Public Health Act. It may be observed, in passing, that this does not necessarily imply removal to hospital, and that it is always possible to notify a case as doubtful; in fact the adoption of this course is often of great value to the practitioner, should any dispute subsequently arise as to his conduct in the case.

Fresh air is all important, but this is frequently neglected, more especially among the educated classes, the open window, or a daily warm bath for the patient, being often regarded as gross heresies. The patient, then, whose illness is of average severity, at the onset should be kept warm and

adequately clad, but there is no reason why the bed should not be in a current of air. All utensils, cups, spoons, etc., whether in a hospital or in a private house, should be marked and kept for the patient's use only. It is important, in hospital practice, to remember that any one case of scarlet fever may be infectious to any other; even in a private house, infection is perhaps more often spread by utensils than is generally supposed. The more one sees of scarlet fever the less is one inclined to believe in infection, as a rule, by "aërial convection." The factors in this, as in almost every other infectious disease, are hands, clothing, and utensils.

The key to the treatment of the average case is to remember that, in scarlet fever, it is the complications which matter, and that these can, to a great extent, be prevented by skilful management. On the other hand, a simple attack is not clinically of any great importance, and, after the subsidence of the initial sore throat, is usually not even uncomfortable. To the children of the poorer classes, the period spent in an isolation hospital is often an unmixed blessing.

In the acute stage, however, we have to relieve the discomfort of the pyrexia, and the pain of the sore throat. For the former, there is nothing so efficacious as total immersion in a tepid bath, and this should be given irrespective of the height of the fever: it is not used primarily as an antipyretic, but in order to keep the skin in a condition of activity, and encourage excretion from its surface, with consequent elimination of toxins. In the average case, the tepid bath should be given twice or three times in the 24 hours, until the temperature has become normal and stationary, and then once a day until the patient is pronounced free from infection. From the first, the bath should be followed twice a week, or more frequently if there is very free desquamation, by the anointing of the entire skin with olive oil, to which a small proportion (1 per cent.) of some convenient antiseptic oil (other than carbolic) is added. Eucalyptus oil is suitable, but it has the disadvantage that it has been advertised as a remedy for scarlet fever. If the throat is very sore, the most efficient remedy lies in packing the neck externally with icebags, but I am not sure that these have any effect on the course of the inflammation, though they undoubtedly relieve

PLATE I.



Fig. 1.—From a photograph illustrating the method of irrigation of the fauces. In order to show the position of the nozzle, the head of the patient is turned slightly towards the camera. In practice his face should look directly into the bowl. The height of the reservoir should be not more than 2 feet above the patient's head.

pain. Ice may be given also to suck. In other cases, irrigation with very hot water sometimes gives marked relief. In no circumstances should lozenges of any description be used, whether they contain antiseptics, such as formalin or a derivative, or analgesics, such as cocain. Their use necessitates the swallowing by the patient of the septic faucial secretion, which is in itself harmful.

Besides the relief of pain, it is necessary to diminish the absorption of toxins from the fauces by irrigation: for this purpose a douche is used. The patient should lie on his stomach, with the head projecting over the edge of the bed, the forehead being supported by one hand of the nurse. A large quantity of fluid should be employed, at least two pints for each irrigation.

The photograph (Plate I.) gives some idea of the relative positions of the patient and the nurse.

After trial of a large number of solutions for this purpose, I have discarded all antiseptics, and now use warm water only. If desired, this can be rendered very faintly alkaline with bicarbonate of soda, and flavoured with thymol or similar compound. The object, however, of the douche is to flush, not to disinfect. Direct treatment of the inflamed parts with germicidal solutions should not be employed except in septic cases (*q.v.*), but gentle swabbing with a solution of borax is sometimes useful in adults when the secretion is very tenacious. Neither the spray nor the paint brush has any legitimate place in the treatment of the faucial angina of scarlet fever. In hospital practice, it is essential, and, in private practice, advisable that the nurse should wear rubber gloves when engaged in the treatment of the throat. Moreover, the nozzle of the douche should have been sterilised by boiling, and a separate one should be used for each patient. The practice of treating the fauces of all patients in a ward with unsterilised and unsterilisable rubber syringes has in all probability accounted for the description of diphtheria and "secondary tonsillitis" as complications of scarlet fever. The former, certainly, the latter, probably, are the direct results of insufficient asepsis.

(b) *Toxic Cases*.—Here we have an intense dose of the scarlatinal toxins *ab initio*, which is commonly associated

with the presence of streptococci in the circulating blood. Inasmuch as the faucial signs are but slightly developed, but little can be done in the way of local treatment. Moreover, as the course of the disease is extremely rapid, there is no time for the preparation of a bacterial vaccine from the patient's own organisms. Inasmuch also as we have no antitoxic serum for scarlet fever, or for streptococcal infection, we are driven to the employment of so-called bactericidal sera. In my own experience, these have frequently proved extremely beneficial, and have undoubtedly often saved life, but they have, perhaps, equally frequently failed to produce any discoverable result whatever. I have, however, never seen any harm accrue from their employment in toxic cases. Consequently, in any given instance they should be given a trial. The literature on this subject is in a state of hopeless confusion, arising from the fact that no two sera are probably alike in composition. It seems clear, however, from my own experience, that—

(1) The serum should be polyvalent—that is to say, more than one strain of streptococci should have been used for the “immunisation” of the horse: it is also desirable that these should have been obtained—partially at any rate—from cases of toxic scarlet fever. I am not, however, prepared to admit the desirability of increasing the number of strains *ad infinitum* on the principle of the domestic shot gun.

(2) The serum should be administered early, and in a large dose. Personally, I usually give 50 to 100 c.c., and I have never seen any harm result therefrom. It seems to be almost certain that doses of 10 to 20 c.c., even if repeated, are practically valueless.

(3) The serum should be given subcutaneously (or in desperate cases by intravenous injection) diluted with two or even three pints of saline solution. Clinically, there can be no doubt that the action of the serum is by this means enhanced. In the light of recent work on immunity and infection, this is probably due to the fact that the injection of the saline solution produces a leucocytosis, and therefore supplies additional “Complement.” I have not obtained the same beneficial results from saline solution alone.

(4) The serum should be sterile and fresh, that is to say, not more than 6 months old.

Hyperpyrexia is best controlled by cold sponging ; delirium by saline purgatives, combined with bromide of potassium. Antipyretic drugs are most certainly to be condemned.

(c) *Septic cases* ("Scarlatina Anginosa").—Here there is intense faucial inflammation with suppuration, on the extent of which, roughly speaking, the constitutional symptoms depend. Similarly, the progress of the case hangs largely on the efficacy of the local treatment of this lesion.

In this connection, two factors must be taken into account, the nature of the treatment itself, and the degree of skill and perseverance with which it is carried out. The latter is undoubtedly the more important, and, in every case of septic scarlet fever, efficient nursing is essential.

What is needed is first to attack the organisms, and then to allay the inflammation. Local treatment must be as energetic as the patient can stand, and, for the first two or three days, it is often imperative to carry it even to the point of some interference with the patient's sleep.

Whatever germicide is selected, there can be no doubt that it should be used in as concentrated a form as possible, in a small quantity, and that it should be applied with a swab. The douche also should be constantly used in order to cleanse the fauces and nasal cavities, but for this purpose it is never advisable to use a powerful or irritating antiseptic : tap water, with or without the addition of bicarbonate of soda, is all that is necessary. For direct application to the fauces there is nothing, in my experience, equal to undiluted Izal, which should be rubbed deliberately over the ulcerated surfaces of the tonsils and palate with a large swab, the mouth being held open if necessary with a gag. Any excess can be removed with another swab. Used in its pure state, Izal has a slightly anæsthetic action, but, if diluted at all, this is lost, and the application is then apt to be momentarily painful. The drug appears to have a selective action on necrotic tissue, and it certainly does not injure healthy mucous membrane. The undiluted fluid should, as a rule, be applied once a day until the healing of the ulcerated surfaces commences. In more severe cases, this may be repeated at more frequent intervals, but irrigation with the douche will be required at least every 4 hours, until the fauces become clean and

remain so.

After removing adhering mucus with a wet swab, the buccal cavity may be swabbed with glycerine and hazeline, or diluted glycerinum boracis; frequently, however, some form of oily application, such as a menthol ointment 10 per cent., a solution of menthol in parolein, or olive oil ($\frac{1}{2}$ drachm to the ounce) seems to be more suitable. Inasmuch as dental caries is an important factor in the production of oral sepsis, any affected teeth should be removed in the acute stage of the disease. Until this is done chemical disinfection is of little value. In some cases, pure peroxide of oxygen applied to the gums is of great benefit, and this drug may also be used in dilute solution (freshly prepared) as a mouth wash.

In many cases, the pharyngeal obstruction, or tonsillar swelling, is so great as to deprive the patient of sleep, and tracheotomy should then be performed. This is, on the whole, preferable to tonsillotomy in the very acute stage, though the latter operation may be required, and should be performed, as soon as convalescence is established. It is different, however, with adenoid vegetations. In many cases, the naso-pharynx is in an extremely septic condition, and is actually the source of the profuse and offensive nasal discharge, which is so characteristic of this type of scarlet fever. Here there should be no hesitation in operating, at any stage, with a Gottstein's curette. The treatment of the suppurative otitis media is dealt with in another portion of this issue.

It is not advisable to incise enlarged and tender cervical glands, unless definite evidence of fluctuation is obtained, so long as the skin over them is not affected. If, however, there is the slightest sign of cervical cellulitis, early and free incision is imperative, whatever the cosmetic result may be. This complication is pre-eminently dangerous in itself, and, if neglected, not infrequently leads to fatal hæmorrhage from the great vessels. The common practice of treating glands, which are not suppurating, by the routine application of fomentations must be strongly deprecated.

In septic as distinguished from toxic cases, antistreptococcic serum should be avoided, as, for reasons which are somewhat too academical to be dealt with here, exacerbation of the symptoms not infrequently results. As a matter of actual

practice, I have never seen it do good in these cases, though at one time, in common with most other observers, I administered it somewhat freely. Internally, the main indication is the necessity for careful and frequent feeding, the nasal tube being used if necessary. In the very acute stage, milk only, or milk thickened with eggs, or possibly with some form of concentrated proteid, is all that can be given on account of the existing dysphagia, but, as soon as possible, carbohydrates should be added, and, provided the patient is hungry, a return to solid food should be quickly made. The use of meat extracts (whether these contain albumen or not) in the acute stage of scarlet fever must be strongly condemned.

Alcohol is, in my experience, usually both unnecessary and harmful in septic cases; if, however, it is used at all, it should be given freely for a definite indication, and soon discontinued. Strychnine has also proved disappointing, and its cumulative action in children, especially where the kidneys are already overworked, must be borne in mind. If the state of the weather permits, cases of septic scarlet fever should, so far as possible, be treated in the open air.

The greatest care must be taken by the nurse to avoid infection of her own hands and clothing, and of the patient's surroundings. In hospital practice, all utensils for any septic case should be marked and washed separately; spoons and feeding cups should be boiled after use, and all bed-linen placed in a tank of disinfectant fluid as soon as it has been removed from the patient. Rubber gloves should always be worn in handling these cases or their infected clothing.

If pyæmia ensues, abscesses should be at once opened. Swellings in and around a joint are especially suspicious, and are often mistaken for rheumatic effusions. The aspirating needle should be freely employed for diagnostic purposes. The primary focus in those cases is often caries in the mastoid process.

(d) *The Complications.*—(1) *Nephritis*: Here the main point is to remember that the tubules of the kidney are not, as a rule, themselves diseased, but are merely pressed upon by the interstitial infiltration; in other words, the natural tendency is to complete recovery, and the indication is mainly to give the kidneys as little work to do as possible. Diuretics,

or renal stimulants of any kind, are, therefore, harmful. Accordingly, the action of the skin should be encouraged by hot packs, or, in milder cases, by hot baths, but when electric current from the main is available, free perspiration may most conveniently be introduced by placing round the patient a cradle covered by hot blankets. To the top rail of this cradle from three to six incandescent lamps are attached, and the current is turned on. When diaphoresis has resulted the cradle is withdrawn, and the hot blankets themselves envelop the patient; by this means the risk of exposure to cold is diminished, and the degree of diaphoresis can be regulated.

The bowels should be kept open by saline purgatives. If coma, with suppression of urine, supervenes, venesection and subsequent intravenous saline solution are often very beneficial. Dry or wet cuppings may be employed, but these are frequently useless in the scarlatinal form of nephritis. Uræmic convulsions are rare in children, and are not often alarming; when they occur they may be conveniently allayed by inhalation of chloroform, followed by rectal injection of chloral hydrate. The main indication, however, is to immediately obtain action of the skin, as stated in a previous paragraph. Pilocarpin should be avoided, especially for children, on account of the uncertainty of its action. In other respects, as regards diet, etc., the usual regimen for cases of acute nephritis should be followed.

Albuminuria.—Apart from nephritis, albuminuria does not, as a rule, require special treatment, and is not in itself an indication for prolonged confinement either to bed or to a milk diet: in fact, the albumen often disappears when such patients are fed in an ordinary way, and allowed to get up. Microscopic examination of the urine in any doubtful case will at once decide whether the albumen is due to nephritis, or is merely symptomatic.

Endocarditis in scarlet fever mainly requires recognition, and then rest in bed in the milder forms, where there is but little alteration in the pulse rate, rhythm, or tension. The more severe cases are, in all probability, rheumatic in origin, and should be treated as such in the accustomed manner by large doses of salicylate of soda, associated with alkalis.

The Cervical Adenitis of Convalescence is usually a premoni-

tory symptom of nephritis, the urine being frequently found to contain blood and albumen two days later. Fomentation to the glands should be avoided ; but if the neck is painful, packing with cotton-wool and firm bandaging usually give relief, and do not determine suppuration. As soon as pus forms, an incision should be made at the lowest point, and a capillary drain inserted. In some cases a thorough scraping of the abscess cavity, followed by packing with dry antiseptic gauze, may be found subsequently necessary.

(e) *Convalescence*. — Here certain points are important, in order that the patient may be freed from infection as soon as possible. In hospital practice, it is advisable to separate the convalescent from the acute cases by transference to another ward after the third week, or perhaps sooner in mild cases. Before leaving the acute ward, the patient should have a bath, be anointed with oil, and should put on disinfected clothing ; the nose and throat should also be well irrigated. Even in cases, treated singly in a private house, daily irrigation of the fauces and nose is desirable throughout convalescence. Each patient should receive a warm bath daily, and, at least three times per week, the skin should be subsequently anointed with oil. The patient should spend as much time in the open air as possible, and fairly active exercise is desirable. In private practice, however, this is often difficult to obtain without contact with others, who may be susceptible to infection.

In all ordinary cases, the diet may consist of whatever the patient can eat and enjoy, but in those cases, in which the initial attack has been severe, a certain amount of over-feeding is often beneficial. Care should be taken that milk is free from the suspicion of contamination by tubercle, as many cases of tuberculosis, both of lungs and glands, have been not improbably caused by the ingestion of tuberculous milk during convalescence from scarlet fever or measles. It is imperative that the milk supply of an isolation hospital should be beyond suspicion, and should be kept so by constant supervision both of the cows and buildings.



TREATMENT OF DIPHTHERIA.

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FIFTEEN years ago the treatment of diphtheria was practically ineffective. When we look back upon the methods usually employed at that time, we are sometimes inclined to wonder if the remedies in vogue did not actually increase rather than diminish the mortality of the disease. So far from the caustics and strong antiseptics, which were freely applied to the throat, limiting the spread of the lesion, it is highly probable that by excoriating and depressing the power of resistance of the surrounding mucous membrane, they actually encouraged it. The mortality was high, indeed 30 per cent. must be regarded as a very moderate estimate of it. The loss of life from the laryngeal form of the disease, particularly after tracheotomy, was literally appalling. In a few years, however, the situation was entirely changed. The treatment of diphtheria, from being a reproach to medicine, became the model of what the scientific treatment of an infectious disease ought to be, and the discovery of anti-diphtheritic serum gave an extraordinary stimulus to that research work on toxins, antitoxins, and immunity, to which we owe the various serums and vaccines so largely employed at the present day.

If, indeed, we were always certain of seeing our patients on the first day of their illness, there would be little use writing such an article as this on the treatment of diphtheria. It would be sufficient to say that antitoxin should be at once injected, and the patient kept at rest in bed for a fortnight or three weeks. But we cannot expect to be so fortunate. Patients often come comparatively late under observation, or again the true nature of the condition may not at first be fully understood. And so it is that diphtheria still remains a most dangerous infection, and one which still affords many opportunities for forms of treatment other than the mere injection of serum. We will consider first, however, the questions which arise in connection with the administration of antitoxin as being by far the most important. Thereafter local applications,

general constitutional treatment, and the management of the different conditions, which complicate the disease, may with advantage be discussed.

Antitoxin Treatment.—It is not within the scope of this paper to produce elaborate statistics vindicating the use of serum treatment. It is true that, occasionally, voices are raised questioning its value. It will be found, however, that most of its critics have had but little experience of its employment, and when we remember that the efficacy of even vaccination against small-pox is still doubted by some medical men, we can well afford to disregard the little criticisms levelled at the use of anti-diphtheritic serum. Every fair-minded man will, of course, admit that all the reduction in the mortality of diphtheria, since the introduction of antitoxin, is not due to its employment. Unquestionably, bacteriological diagnosis has caused the inclusion in our statistics of a certain number of cases which, fifteen years ago, would not have been classed as diphtheria. But when we consider the reduced death-rate of the laryngeal form of the disease, which was as easy to recognise in the days before bacteriological diagnosis as it is to-day, we feel that we stand upon firm ground. An even more fixed type is represented by those laryngeal cases severe enough to require operative interference, and the mortality of these has been reduced from well over 60 to something under 30 per cent., and that not in one hospital, or even in one country, but practically all over the world, and almost simultaneously. Again, all who have had experience of diphtheria, both before and since the introduction of serum treatment, must have been struck by the rarity of any marked spread of the false membrane after the injection of antitoxin. Formerly, when a child was admitted to hospital, the first thing we warned the parents of was the possibility, or even the probability of the extension of a faucial lesion to the larynx. I am bound to say that, nowadays, the possibility of such an occurrence never crosses my mind. Lastly, if, indeed, it is necessary to add anything further, the fact that the patient's chances of recovery steadily grow less with each day that the administration of serum is postponed, as is shown by innumerable statistical tables, should be enough to convince any ordinary person that, in antitoxin, we possess a genuine

specific for the treatment of diphtheria.

The fact that paralysis is met with more frequently now than formerly is readily accounted for, first, by the fact that a larger number of very severe cases survive long enough to manifest it, and, secondly, by the greater attention which has been recently directed to the slighter forms of it. The introduction of serum treatment has certainly produced a greater interest in what was formerly regarded as a very hopeless disease. Antitoxin then has probably done a great deal to cause a higher percentage of paralysis to figure in our statistics, although not in the manner which has been suggested by some of its opponents. We shall see, moreover, that its sequelæ are practically harmless.

As regards the choice of a serum, there is nothing to be said. I have had excellent results, at one time or another, with most of those on the market. In the early days of the treatment, some of the serums were not very good, and the effect of any given dose was often uncertain, but modern standardisation has changed all that, and we can usually roughly estimate the size of the dose required. I say "roughly" advisedly, because the question of *dosage* must remain always more or less a matter of opinion. It is impossible to gauge with absolute accuracy the amount of toxæmia from which any given patient may be suffering. All we can expect to do is to give such a dose as has, in our previous experience, proved satisfactory in patients, who have presented corresponding lesions, and whose general condition has appeared similar. I will endeavour to lay down the principles which guide me in coming to a decision as to what the dose is to be.

First, then, we require to have a clear idea of what we may fairly expect the antitoxin to accomplish. It would appear that all that can be hoped is that, in addition to limiting the spread and breaking up of the false membrane, it will neutralise the toxin, which is free in the blood at the moment of injection. It is possible also that it may detach any toxin which has only recently entered into loose combination with the tissues, but too much must not be expected as regards this. It would appear then useless and wasteful to inject a much larger amount than can be taken up by the circulating toxin. What is to be our maximum dose at a single injection? When

serum was first introduced, the dosage was undoubtedly for the most part too small, and, as the doses gradually increased, it was interesting to note that the mortality gradually decreased. For some time, however, when I began to use what I call large doses for a single injection, that is to say, 16,000 to 20,000 units in very severe cases, I did not notice any particular improvement in my results, and I have now gone back to about 8,000 units as a rough maximum. This, of course, as we shall see, may be repeated. My conclusion was that much of the antitoxin was wasted, and, for all I know, excreted unchanged, and the remedy is so expensive that it is obviously desirable that it should not be used in excess. A more theoretical objection, and yet one which, within limits, is worth serious consideration, is the possibility of the uncombined excess of antitoxin causing the formation of bodies antagonistic to itself in the blood. Were this the case, any subsequent dose of serum would run the risk of being neutralised by these anti-bodies. While, perhaps, the chances of this are very remote, it affords an additional reason for not giving excessive doses merely on the principle that one cannot have too much of a good thing.

And now as regards the *minimum therapeutic dose*. This may be taken as ranging from 1,000 to 2,000 antitoxic units. There is no earthly doubt that even such moderate doses, given early in the disease, are of the greatest value. That was conclusively proved by the improvement in our results, at a time when such doses were seldom exceeded. The smallest dose which I am in the habit of giving at the present time is 1,500 units, and this chiefly to cases which are more bacteriological than clinical diphtheria.

How far, in estimating the dose to be given, are we to be influenced by the *age* of the patient? So far as infants are concerned, I have seldom given more than 4,000 units at a single dose, and this should be an adequate amount, when we consider the small size of the patients. But, in children of over a year, 6,000 units may be given without hesitation, always provided the circumstances of the case call for liberal dosage. Otherwise there is no use in graduating doses according to age. It is in children that the disease is most fatal, and, if anything, they require more antitoxin

than adults for corresponding lesions.

Much more important is the *day of illness* on which the patient comes under observation. For corresponding tonsillar lesions a dose of 1,000 units on the first day may do more than one of 4,000 on the fourth. At one time I used to order, in tonsillar cases, 1,000 units for each day of the disease up to the fourth day. After that, an increase of dose is often of not much advantage, as a patient, whose lesions by the fifth or sixth day are still limited to the tonsils, is not, as a rule, suffering from a very grave attack of diphtheria. It may be granted that this method is illogical, if we cannot expect to neutralise toxin which has already combined with the tissues, but it works very well in practice. Recently, I have so far modified it that second-day cases, which are purely tonsillar, receive 3,000 units, and an additional 1,000 may be added for the following day.

Of more importance still is the *situation and extent of the lesion*. If the false membrane involves the pillars of the fauces, the uvula, or the posterior pharyngeal wall, much more antitoxin will be required. About 1,000 units extra may be added for each of these situations. Thus a case, in which tonsils and uvula alone are patched, and which comes under observation on the third or fourth day, might receive about 5,000 units, and, if the membrane is well forward on the palate, another thousand might be given with great advantage. Cases which, in addition to faucial lesions, present laryngeal symptoms, should never receive less than 6,000 units, and, if the nose is also involved, it is well to increase the dose up to the maximum. Large doses also should be given, if the false membrane is situated on the conjunctiva, or the vulva. It is my usual custom to give purely laryngeal cases 6,000 units, whether there is much dyspnoea or not. All these suggestions must be taken as referring merely to the initial dose, although, in many instances, it will be found that no further serum will be required. As regards purely nasal diphtheria, distinction must be made between those cases, which have merely a dirty chronic discharge containing bacilli, and those which have actual membrane accompanied by well-marked toxic symptoms, the first class hardly requiring serum at all, the second demanding very heavy dosage.

This reminds us that, in estimating our dose, it is highly necessary to pay due attention to the effect which the toxæmia is having on the patient. Two persons, suffering from corresponding lesions, may show very different degrees of toxæmia. A patient, who is pale, drowsy, and prostrated, who has large masses of glands round the neck, or who has much albuminuria, will require much larger doses than one who presents none of these signs. All such bad symptoms must be carefully taken into account, and it is to these patients, and to those with persistent dyspnœa, that we expect to be obliged to administer the maximum dose, and to repeat it at suitable intervals.

While, within limits, our object is to give one dose, which will be sufficient to effect the desired improvement, and while, if patients were only treated early enough, second doses would probably never become necessary, we frequently meet cases in which we cannot expect 8,000 units to check the further production of toxin. How soon, then, is the *dose to be repeated*? This will vary with the circumstances of the case. If the patient is extremely ill, a second injection may be given in eight hours. If the symptoms are less urgent, the interval may be extended to 12 or even 24 hours. For ordinary cases, in which no special danger is apprehended, the 24-hour interval works very well. If, on examination of the patient, it is found that, on the day after the treatment was commenced, there is no diminution in the amount of membrane visible in the throat, and that the general symptoms have not improved, it is necessary to repeat the dose. Any extension of membrane in the face of treatment, a contingency extremely unlikely to occur, unless the severity of the attack was under-estimated when the first dose was prescribed, must be met with a large second dose, certainly with one much larger than the first.

As to the *total amount of serum to be administered*, continued injections at short intervals are required until definite improvement has taken place. So long as there is membrane on the throat, it is probably worth while to push the treatment, unless, of course, it is obviously rapidly disintegrating. In severe nasopharyngeal and laryngeal cases, it may be necessary to give in all 40,000 units or more. My own largest total dose has never exceeded 60,000, a comparatively

low figure when compared with the enormous totals reported by McCollom and others. In not a few cases, there is no visible improvement till the patient has received over 20,000 units, and I think that there is no doubt that, when a diphtheritic broncho-pneumonia is supervening in a laryngeal case, much is to be gained by pushing antitoxin till the respirations and temperature fall. Except in this class of cases, a fall of temperature is not to be regarded as a sign to stop the treatment, unless, indeed, the patient is much improved in other respects. The worst cases of diphtheria often run their course with the temperature normal or subnormal.

Relapse in diphtheria is not frequent. Should it occur, I think that it is probably wiser to withhold serum, if the patient has already received it in his first attack. There is no doubt that the sequelæ of antitoxin are much more troublesome and much more likely to occur, if it is administered in a relapse.

It is hardly necessary to add that the injections must in all cases be made with aseptic precautions. The skin, at the site of injection, must be carefully cleaned and prepared, and the needles and syringes kept scrupulously aseptic. It is usual to inject the serum in the flank. At the Edinburgh City Hospital, we have always preferred to make the injection into the loose tissue between the shoulder blades. The skin here is comparatively insensitive, and the patient is unable to see what is going on.

In certain circumstances, *intravenous injections* may be desirable. These were originally recommended by Cairns. They are particularly applicable to cases coming late under treatment, and suffering from profound toxæmia and a very depressed circulation. It has been suggested that serum, administered subcutaneously, has difficulty in such cases in passing through the glands into the general circulation. Occasionally, I have seen an intravenous injection act almost like magic in an apparently hopeless case, but there are practical difficulties connected with this method. Not the least is to find a vein quickly in a young child with a fat arm, when the circulation is very feeble. Dissecting it out takes time, and, unless an anæsthetic is given, the patient may be alarmed and struggle. To give an anæsthetic, on the other hand, is dis-

tinely dangerous. Recently, Henderson Smith has stated, as the result of many experiments, that, with subcutaneous injection, full absorption of the dose is not complete for two or three days, and that therefore that time is wasted by not employing intravenous injection. I am bound to say that all our clinical experience goes to show that very marked improvement is often effected within 24 hours of a subcutaneous dose, and that I cannot believe it to be necessary to adopt the intravenous method except in special cases, when it may undoubtedly be of great advantage, provided too much time is not taken in the process.

We need have little fear, in ordinary circumstances, of *antitoxin sequelæ*. A certain percentage of patients will have rashes, sometimes as early as one or two days after the injection, sometimes as late as three or even four weeks. Occasionally, nearly all the patients injected with one particular batch of antitoxin will have rashes, probably because the serum of some horses is much more likely to cause rashes than that of others. As regards the other symptoms of the so-called "serum disease," the most frequent are fever and joint pains, either alone, or in conjunction with a rash. The throat is occasionally sore and sometimes patched. So far from the condition being a harmful one, I have often fancied that a smart febrile reaction has been rather useful than otherwise in very prostrate patients. We may follow Rolleston in believing that antitoxin sequelæ occur in direct ratio to the amount of serum given, and in inverse ratio to the severity of the attack. In other words we may expect these phenomena to occur chiefly in patients who have received a larger dose than the severity of the disease warranted. Abscesses when they appear, which is extremely rarely, are the result of sepsis.

In conclusion it may be said that the most important point to be observed is to give anti-toxin at once. The *importance of early dosage* cannot be over-estimated. It is fatal to wait for the result of cultures, except perhaps in the mildest of throats. When once a case is suspected, it should be injected. It can be diagnosed afterwards. Even a small dose, say, 1,500 units, may be of the utmost value in checking the spread of a membrane, and can do the patient no harm at all. A few

hours may make an enormous difference in the prospects of any given case.

Local Applications to the Throat.—With the general use of serum, these have taken a very secondary place in the treatment of diphtheria. Nevertheless, when we consider the foul and septic conditions often met with in the throat, it is highly desirable that some antiseptic treatment should be applied. I still use Löffler's solution of Toluol in absolute alcohol, which was employed in the Edinburgh City Hospital in the pre-antitoxin period. A cotton-wool swab, impregnated with this solution, may be pressed firmly upon the false membranes, care being taken to avoid swabbing the unaffected parts of the throat. The solution should not be used too frequently, thrice daily being usually sufficient. Swabbing with boroglyceride may also be employed every four hours. Those patients who can gargle may do so with listerine, a dessert-spoonful to the tumbler of hot water, or with chlorine water, which, if not so pleasant, is said to be very effective. Sprays of peroxide of hydrogen, or corrosive sublimate in a 1-4000 solution may also be freely used. If the throat is much inflamed and swollen, great relief is usually obtained by the inhalation of steam, with or without tincture of benzoin or creasote. The mouth must be kept scrupulously clean, and it is well to remove all loosely attached fragments of membrane. In some cases douching or syringing is of great advantage. For nasal cases, the spray or syringe must be frequently used. In patients with a hæmorrhagic tendency, the throat and nose may be sprayed with a solution of adrenalin chloride, but too much must not be expected from any method of treatment in this type of case. Should the glands be much enlarged, and form a collar round the throat, fomentations wrung out of weak carbolic lotion (1-60 to 1-80) may be frequently applied, or the neck merely wrapped up in cotton-wool.

General Management.—It is of the greatest importance that, from the moment a patient is diagnosed as having diphtheria, he should be kept rigidly in the recumbent posture. Sitting up should not be allowed on any pretext whatever. I am accustomed to allow my patients only one very soft pillow, so that the head is scarcely raised. A second pillow is added about a fortnight afterwards in the average

case, although in patients, whose pulse is poor, it is desirable to wait longer before making this concession. Very slight cases of the disease may be gradually propped up in bed from the middle of the third week, and allowed to get up for an hour or two early in the fourth. If, however, the attack has been at all a sharp one, it is safer to keep the patient in bed for at least four weeks. By that time, provided the pulse is satisfactory and there is no paralysis, most patients may rise with safety, and a week later, if they walk without difficulty, and two consecutive negative cultures have been obtained from the throat, they may leave hospital. Adults should not resume work, or children return to school, for some weeks later, and a complete change of air is often of great advantage. It may be added that the various forms of paralysis not infrequently seem to follow an increased employment of the muscles affected. Too much reading, for instance, may be responsible for strabismus or ciliary paralysis.

Considerable attention to the question of *diet* is also necessary. In a depressing disease like diphtheria, it seems reasonable to allow a liberal dietary, but it must be remembered that the forcing of too much nourishment on the patient may readily induce vomiting, and in no disease is vomiting to be regarded as more dangerous, owing to the strain it may put upon an already debilitated heart. So long as the pyrexia persists, which, as a rule, is only for a few days, a fluid diet is amply sufficient. Should the throat remain painful after the temperature has fallen, the patient should still be restricted to fluids. Milk and beef-tea, occasionally supplemented by a beaten-up egg, are in most cases sufficient nourishment. In severe cases, the diet must be kept as simple as possible, and, if there is any sign of gastric irritability, it is well to peptonise the milk. The main principle of feeding should be "little and often," and, during the acute stage, something should be given at least every four hours. In moderate cases, after the pyrexia has subsided, soft solids may be given, such as milk puddings, oatflour porridge, stewed fruit, and jellies. Strong soups may take the place of beef-tea. I do not regard the presence of albuminuria as any contra-indication to an increase in diet. If the food given is tolerated, a rapid increase may be allowed, white fish and other solids being first

given, and shortly thereafter a reasonable quantity of butcher's meat.

Throughout the course of the illness, all patients, and children particularly, must be carefully watched for any sign of difficulty in deglutition, a complication which may appear comparatively suddenly, and which has been occasionally responsible for death by choking. Young children are best fed by a nurse, as otherwise they are apt to attempt to take too much at once. Should paralysis of deglutition occur, nasal feeding should be at once resorted to.

I believe that most patients, suffering from a moderate or severe attack of diphtheria, are the better for a small allowance of alcohol. The disease is so typically depressing in its nature, and the tendency for the heart to fail is so marked, that some form of stimulation is usually advisable, if not absolutely necessary. In what we may call "bacteriological" cases, those which do not present very characteristic clinical appearances, the use of alcohol is uncalled for.

Some form of *tonic treatment* is usually employed. Perchloride of iron was for a long time used, and was even regarded as exercising a specific action on the course of the disease. I never saw it do much good, and it often upsets the stomach. Strychnine is, I believe, the most satisfactory tonic, and may be given freely. Its systematic use, however, cannot be trusted to prevent either heart failure or paralysis, though I am inclined to think, it lessens the tendency to both. I have recently been testing the value of formic acid, as recommended by Croom, and have employed it in over 700 cases. It appears to be an excellent tonic, but, so far as we can at present judge, not more efficient than strychnine, although our statistical results are slightly in its favour. Adrenalin chloride has been recommended by Rolleston for bad cases. All these drugs have been used mainly with the view of preventing cardiac failure. In the convalescence of ordinary cases, an iron tonic may be prescribed with advantage, especially if the patient is anæmic.

Treatment of Laryngeal Diphtheria.—Admirable as are the results of operative interference since the use of antitoxin became general, our chief object, in hospital at least, will always be to avoid operation. There is no doubt that much

can be done to alleviate dyspnœa, and as, when a suitable dose of serum has been given, improvement may be expected in from 24 to 36 hours, every possible means of palliation should be employed. The most satisfactory therapeutic measure is unquestionably the inhalation of steam. The carping critic may suggest that it can do little good to place any patient in an artificial fog, or to fill the lungs of a suffocating infant with water. But all clinical experience goes to prove that, in acute laryngeal inflammations, steam gives more relief than anything else. It certainly diminishes the tendency to spasm, which is so largely responsible for severe attacks of dyspnœa, it assists in the expulsion of loose membranes, and, as is easy to see from the way children arrange themselves in bed to get the full advantage of it, it is of the greatest comfort to the patient. It is, however, often a difficult matter to give steam satisfactorily from the ordinary croup kettle, unless a tent is used, and I must confess that I have an objection to any method which prevents the free circulation of air round an infectious patient. Two or three croup kettles working at once, and without a tent, can be trusted to give an adequate supply of steam. For hospitals a more efficient plan is that in use at the Edinburgh City Hospital, where the steam is laid on from the boilers, and supplied to the patient through pipes on swinging brackets at each side of the cot, at a pressure reduced to about $3\frac{1}{2}$ pounds.

In addition to steam inhalation, hot fomentations, frequently applied round the throat, are often effectual. While medicinal treatment cannot be depended upon, the old plan of giving ipecacuanha wine, even to the extent of causing a vomit, has its merits for sthenic cases seen on the first day of their illness. In ordinary cases, five-drop doses of the wine assist the expectoration of loose membrane. Belladonna, if pushed, is often of value in relaxing spasm, but it must be given very freely, if it is to be of any use. Every care must be taken to support the heart by appropriate stimulation.

As regards the indications for operative interference, they differ according to the circumstances of the case. In private practice, when the medical man cannot always be within reach, it is obviously safer to operate early. Should dyspnœa be well marked with definite recession of the soft parts of the

chest, or should there be a history of severe paroxysms of croup, it is wisest to perform tracheotomy at once. But in hospital practice I believe in waiting as long as possible, and in giving serum treatment a fair chance. There is, as a rule, no need to interfere till the patient enters the third stage of croup, when the face gets pale, the respiration more shallow, the recession less, and the pulse weaker and more rapid. The condition of the pulse indeed is my chief guide in deciding whether to interfere or not. Another point of considerable importance is the length of time the patient has been ill. We can take liberties in the first three days of a case of diphtheria which it would be foolish to risk a day or two later, when it is probable that the disease has begun to affect the heart muscle, and there is the possibility of the patient succumbing from shock on the table. To sum up, then, in hospital interfere late, in private practice interfere early. Operation always has its dangers, and I think that there is more real satisfaction to be gained from successfully dispensing with it, than there is from the most brilliant results of tracheotomy or intubation.

As regards these two methods, it is well to recognise that intubation has now taken its place as a real rival of the more serious operation. The prejudice against it seems still very marked in this country, but it is almost universally practised in America and France. In my own view, it is a hospital operation, and is not so well suited as is tracheotomy for private practice, unless indeed it is performed very early, that is to say, in cases which do not urgently call for interference. Such patients might be left by the medical man with more confidence if a tube has been inserted, and, in the event of it being coughed up, the chances are that no great harm will follow before aid arrives, or before the serum has had time to act. But, in severe cases, the risk of a coughed-up tube cannot be lightly disregarded, and, unless a doctor is always on the spot, tracheotomy is a much preferable operation.

There is a belief in some quarters that, even in hospital, severe cases are best treated by tracheotomy. I cannot recognise any distinction in the indications for the rival methods. In hospital, it should be only severe cases which are interfered with at all, and I have never been able to predict that any given case will not be relieved by the intu-

bation, which, as a routine, I practise first, and will obtain relief from the subsequent tracheotomy. In my experience, the number of cases unrelieved by intubation which recover after a secondary tracheotomy, is extremely small, even should the cutting operation be performed within half an hour of the intubation. In this connection, it may be remarked that, when once intubation has given adequate relief, it should be persisted with, even if the tube has to be very frequently replaced. Tracheotomies, undertaken in order to allow a patient to dispense with an intubation tube, are seldom satisfactory, and, rather than adopt this plan, it is better to allow the patient to wear this tube for three or four weeks. In the vast majority of cases, however, the patient can breathe naturally within four or five days. The psychological moment for removing the tube the first time is about 60 hours after the intubation. The chances of it remaining permanently out are much increased, if the temperature and respirations have fallen to normal. If it can be left out for four hours, it is unusual to have to replace it. Vulcanite tubes should be used, and I prefer to leave the string attached, so that if necessary the tube can be promptly pulled out.

The space at my disposal does not allow me to enter into the question of the technique of either tracheotomy or intubation. When once relief has been given to the breathing, it is as well to cut down the amount of steam supplied to the patient, as prolonged existence in a cloud of vapour is undoubtedly depressing. After both operations, however, I prefer to keep the atmosphere moist and warm, and, as much steam as can be obtained from one croup kettle, without a tent, is usually to the advantage of the patient. The feeding in both cases must be entirely by means of a nasal tube.

Treatment of Heart Failure.—We have seen above that the tonic treatment, usually prescribed in the disease, has for its object the prevention of cardiac failure. Too frequently, we must admit, it is unsuccessful, but that such drugs as strychnine and alcohol have some effect in warding off this danger there is, I think, no doubt whatever. When the pulse becomes weak and irregular, there is little more that can be done. Such drugs as digitalis and strophanthus are, in my experience, absolutely useless. I cannot speak with the same certainty about adrenalin, which sometimes appears to do the patient

much good. My objection to it is rather the theoretical one, that it seems inadvisable to use a drug, which so distinctly raises blood pressure, when the heart muscle is in a degenerated condition. It is this consideration which has caused some practitioners to recommend belladonna or atropine for the failing heart of diphtheria, and, judging from my experience of these drugs in croup, I am inclined to believe that their effect on the general circulation is a good one. Formic acid, which has a very slight effect on the blood pressure, sometimes seems to steady a pulse, but any effect cannot be expected before the lapse of 48 hours. It may be given in 10, or even 20. minim doses of a 25 per cent. aqueous solution, if well tolerated by the stomach. So long as the pulse is irregular the patient must be kept absolutely recumbent.

When cardiac failure has declared itself, that is to say, when such symptoms as syncope, vomiting, and præcordial pain have occurred, the chances are all against the possibility of the patient's recovery. In sudden collapse, hot applications over the heart and injections of strychnine or ether may be employed. The injection of normal saline, either into the rectum or under the skin, is often useful. The patient, as a rule, rallies from the first collapse, but seldom survives a second, or third, should it occur. All forms of treatment are very disappointing. Owing to the cardiac sickness the feeding must be entirely rectal. Iced brandy or champagne is often tolerated, when given by the mouth. If there is much pain, and the patient is anxious or restless, very small doses of morphia and atropine, subcutaneously, are quite justifiable, although the albuminuria and the scanty amount of urine may seem to contra-indicate such a course. Indeed I have seen several patients survive, when treated in this way, the complete rest given by the morphia being of the highest value.

Treatment of Paralysis.—The exceedingly transient nature of many forms of post-diphtheritic paresis makes it exceedingly difficult to estimate the value of any form of treatment. Strychnine should be pushed. The use of antitoxin is not to be recommended, first, because its value is extremely doubtful, and secondly, because of the risk of "super-sensitization," and severe serum phenomena supervening. Complete rest is requisite, and indeed paralysis would probably seldom occur except after the graver forms of diphtheria, if care was taken

to prevent an undue use of function in the muscles likely to be affected. Should deglutition become difficult, the nasal tube must be used at once.

Prophylaxis.—The most important points are the isolation of the patient, and the careful disinfection of everything used by him. Spoons, crockery, and the like must be set aside for his special use, and frequently boiled. The isolation should be maintained until at least two negative cultures have been consecutively secured from the throat. A long time is often required before this is attained. Should the bacilli persist for many months, perhaps the best plan is to test their virulence on small animals, and, if they are non-virulent, to dispense with further isolation, but to make cultures at intervals, and direct the patient to continue local antiseptic treatment. Persistence of the bacilli is more likely to be met with when the tonsils are large and ragged. During the patient's stay in isolation, everything must be done by means of local applications to the throat in order to get rid of the micro-organisms, but, occasionally, even the strongest antiseptic lotions appear to effect little in this respect.

Should diphtheria break out in a school or hospital ward, all throats and noses should be at once tested for the bacillus, and those children who harbour it should be immediately isolated. All spoons and utensils must be sterilised after each meal, and great care taken to avoid the common use of handkerchiefs, towels, and the like. Unless several cases occur, prophylactic injections of serum may well be restricted to those who harbour the bacillus. If, however, there is any tendency for the outbreak to spread, all persons in the school or ward should receive 500 units as a prophylactic dose. It is generally admitted that this is an efficient protection for three weeks, by which time probably all risk is over. In injecting a large number of persons at one time, the danger of sepsis is appreciably increased, and the greatest care must be taken to see that the needles used are efficiently sterilised and the skin carefully prepared. An abscess is an awkward complication at any time, but most of all so when caused by merely a prophylactic injection. And yet my experience of such abscesses is, for the most part, in connection with these injections. Other sequelæ are seldom seen, the dose of anti-toxin required being, as a rule, too small to give trouble.

DIPHThERITIC PARALYSIS.

By J. D. ROLLESTON, M.A., M.D.,

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THE following observations are based on the study of 1,500 consecutive cases of diphtheria, which have been under my care at the Grove Hospital in the course of the last six years. In all the cases the throat had been involved in the initial attack. Paralysis, following diphtheria, of the skin, nose, or larynx, unassociated with angina, has been recorded, but no case has come under my notice.

Frequency.—335 cases, or 22·3 per cent., showed some form of paralysis, 135 were severe, 58 were fatal. In each series of 100, the percentage of paralysis cases was never less than 14 or more than 31.

Relation of Paralysis to character of initial attack.—Table I. clearly shows that a very direct relation exists between the initial attack and the frequency and severity of the subsequent paralysis. In the determination of the various grades of severity, it is important to recognise that faucial œdema, considerable glandular and periglandular swelling, pitting of the skin on pressure over the swelling, oral fœtor, and profuse thick or sanious nasal discharge, are more important indications of a severe attack than an extensive exudation alone, though these signs are often associated therewith. The occasional, though rare, occurrence of severe paralysis after mild angina can be explained in most cases by neglect of treatment in the early stage, and still more by too early rising from bed and resumption of a laborious occupation.

TABLE I.—SHOWING RELATION OF PARALYSIS TO CHARACTER OF INITIAL ATTACK.

A.—Faucial cases, with or without nasal and laryngeal involvement :—

Character of Initial Attack.		Paralysis Cases of all Kinds.	Percentage.	Severe Paralysis Cases.	Percentage.
Class I. Very severe,	146 cases -	104	71·2	72	49·3
Class II. Severe,	274 „ -	133	48·5	55	20·07
Class III. Moderately severe,	130 „ -	28	21·5	1	0·7
Class IV. Moderate,	364 „ -	56	15·3	7	1·9
Class V. Mild,	516 „ -	14	2·7	0	0
Class VI. Very mild,	49 „ -	0	0	0	0
Total -	1,479	335		135	

B.—Nasal cases only, moderate	- 2	} Followed by no paralysis.
mild	- 6	
very mild	- 2	
C.—Laryngeal cases only, severe	- 7	
moderate	- 3	
mild	- 1	
	—	
	21	

Of the 146 very severe cases, 30 died of toxæmia before any paralysis had developed, so that of the survivors in this class only 12 suffered no paralysis. Paralysis was much more frequent and severe in the faucial cases in which there was nasal involvement than in those in which the nostrils were not affected.¹ Thus among 1,087 faucial cases, with or without laryngeal involvement, there were 157 paralysis cases (14·4 per cent.), 36 of which were severe, while among 392 faucial and nasal cases there were 178 paralysis cases (45·1 per cent.), 99 of which were severe. It is a striking fact, illustrative of the benignity of relapses in diphtheria, that not one of the 24 cases of relapse, which occurred among the 1,500 cases, was complicated by paralysis. Not only is actual paralysis commoner after severe attacks, but affection of the tendon jerks is also commoner after severe than after mild angina.² The superficial reflexes are only lost in cases of generalised paralysis.³ The affection of the tendon reflexes in 761 cases in which they were examined is shown in Table II.

¹ J. D. Rolleston: "Rhinorrhœa in Faucial Diphtheria," *Metrop. Asylums Bd. Rep.*, 1906.

² *Id.*, *Brain*, 1905, p. 68, "A Note on the Tendo Achillis Jerk in Diphtheria."

³ Ferranini has happily styled the superficial reflex, the *ultimum moriens* of the nervous system. (*Riforma Medica*, 1893, Vol. 4, p. 583.)

TABLE II.—RELATION OF AFFECTION OF TENDON JERKS TO CHARACTER OF INITIAL ATTACK.

Initial Attack.	Condition of Knee Jerks.		Condition of Ankle Jerks.	
	Lost.	Sluggish only.	Lost.	Sluggish only.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Class I. Very severe - -	59·2	18·5	41·9	25·9
Class II. Severe - - -	28·4	22·9	27·7	23·6
Class III. Moderately severe -	15·6	23·4	12·3	15·06
Class IV. Moderate - -	11·1	16·4	7·6	14·1
Class V. Mild - - -	7·2	13·9	3·3	6·9
Class VI. Very mild - -	0	—	—	—

Relation of Age to Paralysis.—Table III. clearly shows that diphtheritic paralysis is much commoner in children than adults.

TABLE III.—SHOWING RELATION OF AGE TO PARALYSIS.

Age.	0-1.	2-6.	6-10.	10-18.	18-20.	20-30.	30-40.	40-50.
Number of patients - -	78	707	447	163	12	62	25	6
Number of paralysis cases -	15	181	103	29	0	5	2	0
Percentage of paralysis cases -	19·2	25·6	23·04	17·7	0	8·06	8·0	0

Opponents of this view, whose statements are based rather on the authority of Landouzy¹ than on independent observations, have disregarded the fact that mild forms of paralysis are much more easily overlooked in children than in older persons. In the table above, I have employed the age distribution adopted by Landouzy, for the purpose of contrast, since my conclusions are exactly the reverse of his.

The rarity of severe paralysis in adults is shown by the following facts. The varieties of diphtheritic paralysis, in order of severity, are cardiac paralysis, diaphragmatic paralysis, pharyngeal paralysis, and paraplegia. Of the 55 fatal cases of cardiac paralysis, the oldest patient was 13 years. Of the 10 cases of diaphragmatic paralysis, the oldest was 8 years.

¹ *Des paralysies dans les maladies aiguës*, 1880, p. 41.

Of the 22 cases of pharyngeal palsy, the oldest was 14 years. Of the 31 cases of paraplegia, only 2 were over 8, 1 aged 14, and 1 aged 29 years.

Precocious paralysis of the palate, *i.e.*, paralysis occurring before the third week, which is characteristic of the grave forms of diphtheria, and is usually much more persistent than palatal palsy of later onset,¹ occurred in 92 cases, but only our patients, two of whom were 14 years, one 15 years, and one 29 years, were above the age of 13. Further, it may be noted that, of the 69 cases of hemiplegia recorded in literature, the oldest patient was aged 15 years.²

Affection of the tendon jerks is also commoner in children than in adults. Thus among 761 patients, in whom the tendon jerks were examined in the course of their illness, the knee jerks were lost in 141, and the ankle jerks in 96, but only two of those patients were over 14 years, though 63 of the 761 were above that age. The predilection of paralysis for children is in accordance with the fact, which I have illustrated elsewhere in the case of pneumonia and relapses,³ that the complications of diphtheria are both relatively and absolutely commoner in children than in adults. Severe paralysis in an adult doubtless displays a greater richness of symptoms, especially as regards sensory disturbance, the investigation of which in young children is often impossible. Further, certain paralytic phenomena are by their very nature peculiar to adults, such as the loss of sexual inclination and power. Lastly, convalescence from severe paralysis is usually much more tedious in adults. All these circumstances tend to make the clinical picture of diphtheritic paralysis more impressive in adults, and have given rise to erroneous ideas as to the relative frequency of the age incidence.

Relation of Paralysis to Antitoxin.—Table IV. shows that, of those injected on the first day of disease, comparatively few suffered paralysis, and in no case was the paralysis severe. During each of the four subsequent days the frequency and severity of the paralysis cases increase. After the fifth day the incidence of paralysis falls.

¹ J. D. Rolleston: *Rev. of Neurol. and Psych.*, 1905, p. 608, "Precocious Paralysis of the Palate in Diphtheria."

² *Id. ib.*, 1905, p. 722, "Diphtheritic Hemiplegia."

³ *Brit. Journ. Child. Dis.*, 1906, p. 537, "Lobar Pneumonia as a Complication of Diphtheria," and 1907, p. 333, "Relapses in Diphtheria."

TABLE IV.—SHOWING RELATION OF PARALYSIS TO DAY OF DISEASE ON WHICH ANTITOXIN WAS INJECTED.

Day of Disease.	Total Number of Cases injected.	Paralysis Cases.	Per-centage.	Severe Forms only.	Per-centage.
1st day - -	61	3	4·9	0	0
2nd „ - -	319	50	15·6	13	4·07
3rd „ - -	367	75	20·4	30	8·1
4th „ - -	301	90	29·9	34	11·2
5th „ - -	197	62	31·4	32	16·2
6th „ - -	96	30	31·2	17	17·7
7th „ and later -	104	23	22·1	9	8·6
	1,445	333	—	—	

Among 55 cases, which did not receive antitoxin, only two, in which no membrane was present on admission, developed paralysis, in each case of a mild character.

Important as is the early administration of antitoxin, it is a mistake to suppose, as do some authorities, that antitoxin is useless in late cases.¹ 211, or 14·06 per cent., of the present series were admitted after the fifth day. With the exception of nine very mild cases, all, in whom membrane was present, received antitoxin. Of these, 23 died—a mortality of 10·9 per cent. Since the mortality in the pre-antitoxin era was never less than 28·8 per cent., and frequently rose to 50·0 per cent. or more, the efficacy of antitoxin, even in late cases, is obvious. In practice, we should regard the presence of membrane as an indication for serotherapy. In all my cases, the antitoxin was given subcutaneously.

Relative Frequency of each Form of Paralysis.—Table V. shows that the three commonest palsies are those which are the least serious, and that the dangerous palsies are much less common.

Hemiplegia, occurring in diphtheria, differs from diphtheritic paralysis, properly so called, in being primarily a vascular lesion. In most cases, it is due to cerebral embolism, secondary to endocarditis of the apex (Marfan²), and is therefore most likely to occur in those cases in which the

¹ *Lancet*, 1., 1907, p. 1112.

² *Leçons Cliniques sur la Diphtérie*, 1905, p. 28.

heart is severely affected. It is most liable to develop between the second and sixth weeks. Only one case occurred in the present series, and only three among 6,559 cases of diphtheria admitted to the Grove Hospital between August 1899 and December 1907. In 1905¹ I was able to collect only 65 cases from literature. Other cases have since been recorded by Escherich² (two cases), Hecht,³ and Moltchanoff,⁴ making a total of 69.

Date of Onset.—Apart from severe diphtheria, in which palatal and cardiac palsies may develop within the first fortnight, paralysis rarely occurs before the third week. Palatal palsy is usually the first to appear, and is manifested by a nasal twang of the voice. In most cases, especially among older patients, the impairment of function is limited to this, and regurgitation does not occur. Examination of the palate on phonation in such cases will show that the velum is not entirely inert. After an exclusively, or predominantly, unilateral angina, the corresponding part of the palate alone may be affected. In only one case did ocular palsy occur before the fourth week—a case of ciliary palsy on the nineteenth day. The usual time for cycloplegia is the fourth or fifth week. In most cases, paralysis of accommodation exists alone, without coincident paralysis of the sphincter pupillæ. Thus it will be found that, though the patient will be unable to read, or to thread beads, the pupils will contract when he is told to fix an object. Squint, which is most frequently an internal strabismus, usually recurs a little later than paralysis of accommodation. Next to the first two weeks, the fifth and sixth are the time of greatest anxiety, since this is the period of predilection for pharyngeal and diaphragmatic paralysis. Palsies of the lip, face, and neck muscles, paraplegia, vesical and rectal troubles (incontinence or retention) rarely occur before this period.

Disturbance of sensation is also a late phenomenon. An instructive example of the various forms of paræsthesia, including astereognosis, I have reported in a previous paper.⁵ Vaso-motor changes manifested by diffusé and transient erythemata, urticaria, dermatographia, and hyperidrosis are not infrequently associated with the generalised paralysis which

¹ *Rev. of Neurol. and Psych.*, 1905, p. 722.

² *Wien. Med. Woch.*, 1907, p. 478.

³ *Progressive Medicine*, Vol. 3, 1907, p. 254.

⁴ *Revue Neurologique*, 1907, p. 2145.

⁵ *THE PRACTITIONER*, II., 1904, p. 804.

occurs at this time. It is important to note that, though the knee and ankle jerks may be lost at an early stage, it is not till the fifth or sixth week that the superficial reflexes are abolished. Their loss is much less frequent and of much shorter duration than that of the tendon jerks, and, as already stated, only occurs in cases of generalised paralysis. Mental impairment may be associated with diphtheritic, as it may be with other forms of infantile hemiplegia, but, apart from apathy and mutism in children, and despondency in adults, I have not observed any psychical changes in connection with the ordinary forms of diphtheritic paralysis. Korsakoff, in 1890,¹ drew attention to the fact that the polyneuritic psychosis, though so frequent in alcoholic neuritis, never occurs in diphtheria. Babinski in 1905² writes to the same effect.

TABLE V.—SHOWING DATE OF ONSET AND FREQUENCY OF EACH FORM OF PARALYSIS.

—	Palatal.	Ciliary.	Squint.	Cardiac.	Labial.	Paraplegia.	Pharyngeal.	Dia-phragmatic.	Hemiplegia.
1st week	- 19	0	0	21	0	—	0	0	0
2nd „	- 71	0	0	34	0	—	0	0	0
3rd „	- 51	7	10	0	0	—	0	0	0
4th „	- 28	69	8	0	0	—	0	0	1
5th „	- 21	60	11	0	6	—	3	1	0
6th „	- 29	24	11	0	13	—	7	2	0
7th „	- 9	5	14	0	12	—	11	0	0
8th „	- 0	4	17	0	6	—	1	7	0
Total	- 228	169	71	55	37	31	22	10	1
Percentage } Frequency }	15.2	11.2	4.7	3.6	2.4	2.06	1.4	0.6	0.06

Mortality.—The following figures show the place which paralysis occupies as a cause of death in diphtheria. Of the 1,500 cases, 116 died—a mortality of 7.7 per cent. On subtracting 27 cases, which died within 24 hours of admission, the deaths are reduced to 89—a mortality of 5.9 per cent. 30 died of toxæmia within the first few days of the disease before paralysis had developed. 16 deaths were due to extension of membrane to the lungs in 92 tracheotomy cases.

¹ *Archiv für Psychiatric*, Bd. 21, p. 693.

Traité de Méd. Bouchard et Brissaud, Vol. X., p. 125.

Broncho-pneumonia, apart from tracheotomy, caused nine deaths. Intercurrent diseases—two cases of scarlet fever and one of congenital syphilis—were responsible for three deaths. The remaining 58 deaths were due to paralysis, but in only three did the paralysis first start after the end of the second week, death being due in these three cases to paralysis of the diaphragm. In all the rest (55), death was due to cardiac paralysis, which had first developed before the beginning of the third week.

Prognosis.—Complete recovery from diphtheritic paralysis is the rule, death the exception. Excluding hemiplegia, from which complete recovery seldom occurs, the rarest contingency of all is for the paralysis to become chronic, owing to sclerosis, or atrophy of the bulbar nuclei. I have not yet met with such a case, but eight are recorded in literature.¹

Usually the prognosis depends upon the age of the patient, the situation of the paralysis, and the date of onset. The older the patient the better the prognosis. Cardiac pharyngeal and diaphragmatic palsies are the most serious. The onset of cardiac paralysis before the third week is of very unfavourable omen. Cardiac involvement, occurring later, is much less serious, and, in none of my cases, was fatal. Unexpected death in convalescence from diphtheria, that bugbear of the physician,² in eight years' experience of infectious diseases, I have not yet witnessed. This I attribute to the fact that no patient, exhibiting dilatation of the heart, or marked irregularity of its force and rhythm, occurring within the first six weeks, was allowed to sit up while these symptoms lasted.

The evil significance of early palatal palsy, from its frequent association with cardiac paralysis, is shown by the fact that the mortality among the 92 cases, in which palatal palsy occurred before the third week, was 35·8 per cent., as contrasted with a mortality of 1·4 per cent. among those in which this palsy occurred at a later date.

I have elsewhere³ dwelt on the prognostic value of the progressive enlargement of the liver, which precedes and

¹ V. *Abstr. in Rev. of Neurol. and Psych.*, 1907, p. 56.

² "Risk of sudden death from failure of the heart's action hangs over the convalescent like the sword of Damocles." *Henoch, Lect. on Child. Dis.*, Vol. II, p. 296, *New Syd. Soc.*

³ *THE PRACTITIONER*, II., 1904, p. 795, and *M. A. B. Reports*, 1904.

accompanies the signs of cardiac involvement. The importance of this sign is illustrated by the fact that, out of 83, who showed any signs of liver enlargement, 48 died, a mortality of 57·8 per cent., as compared with a mortality of 7·7 per cent. among 1,120 cases of diphtheria, in which a routine examination of the liver was made.

On the other hand, a most favourable prognostic significance is to be attached to a generalised eruption of urticaria occurring at the usual time, *i.e.*, within a week from injection. In cases which die of cardiac paralysis within the first three weeks, there is either no rash at all or it is but poorly developed. The appearance of the later serum phenomena, especially joint pains and pyrexia, is of still more favourable import. It may, therefore, be said that recovery from the initial angina and the diminished chance of subsequent paralysis compensate for a sharp attack of the serum disease.¹

Treatment.—Prophylaxis is of the utmost importance, and should be attempted by rest in bed, in the recumbent position, for periods varying from three weeks after mild angina to seven or eight weeks after a severe primary attack. If no paralysis has developed by the end of the seventh week, the patient may safely be allowed to sit up, and, in a few days, to leave his bed, nor indeed should the persistence of slight ocular or palatal palsy, after that date, provided the diaphragm and pharynx are unaffected, contra-indicate the patient sitting up. Cardiac dilatation and arrhythmia are sometimes very persistent after diphtheria, but, in the absence of other contra-indications, no useful purpose can be served by keeping such cases in bed beyond the eighth week. The oral employment of adrenalin, which I advocated in THE PRACTITIONER, in 1904, as prophylactic treatment against cardiac paralysis, I have persisted in since to the almost entire exclusion of other drugs, always avoiding the administration of brandy and strychnine by the mouth or hypodermic injection during the acute stage. The best results are obtained by giving 10 minims two hourly during the first fortnight. The symptoms of suprarenal insufficiency, manifested clinically by arterial hypotension and neuro-muscular asthenia, and anatomically by cloudy swelling, necrosis, and hæmorrhage, so

¹ Cf. THE PRACTITIONER, I., 1905, pp. 672, *et seq.*

frequently found in severe cases of diphtheria, justify the use of this drug. This method has since been adopted by Dr. Netter at the Trousseau Hospital in Paris¹ with gratifying results. A modification of the method, consisting in combining adrenalin with strychnine in hypodermic injections, is warmly advocated by Dr. Crookshank.² More recently Pospischill³ recommends the combined oral administration and subcutaneous injection of adrenalin in diphtheria.

On the occurrence of vomiting, associated with cardiac paralysis, mouth feeds should be stopped, and nutrients, consisting of 4 ounces of peptonised milk with 20 minims or more of adrenalin, should be given four hourly. The employment of large doses of tincture of belladonna (m. xx-xxx) in alternate nutrients with 30 grains of potassium bromide, as advocated by Dr. Garratt,⁴ will sometimes act where adrenalin fails.

Owing to concurrent anæsthesia of the larynx, and the possibility of deglutition broncho-pneumonia, it is safer to adopt rectal rather than nasal feeding during pharyngeal paralysis. Rectal feeding may be resorted to all the more readily, as pharyngeal paralysis is usually of short duration, rarely lasting longer and not infrequently for a shorter period than 14 days. Thirst may be relieved and emaciation checked by the administration of 6 ounces of water twice in the 24 hours in addition to the nutrients. While the pharyngeal palsy lasts, the foot of the bed should be raised to allow the mucus and saliva, which the patient cannot swallow, to drain through the mouth and nostrils.

The use of antitoxin in diphtheritic paralysis has been strongly recommended by Comby, but the natural tendency in man to spontaneous recovery, and the failure of this treatment in experimental diphtheritic paralysis in rabbits and guinea-pigs, suggest that the vaunted successes of this treatment are, as I have recently pointed out,⁵ due less to a specific than to a psychotherapeutical action.

¹ Baudoin: *Thèses de Paris*, 1906-1907, No. 344, *La Diphtérie à l'Hôpital Trousseau en 1905*.

² *West Lon. Med. Journ.*, 1907, p. 92, and *Lancet*, I., 1908, p. 1237.

³ *Wien. Klin. Woch.*, 1908, pp. 1046 and 1045.

⁴ *St. Bart. Hosp. Rep.*, 1904, p. 41, and 1907, p. 93.

Lancet, II., 1908, p. 261.

ON TRACHEOTOMY.

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ALTHOUGH those hospitals, in which tracheotomy is a frequent operation, differ considerably in their methods, I hope that the following description of the method in use at my own may be of use to some who only occasionally have to perform it.

No anæsthetic is used. Three assistants are required besides the operator ; usually two doctors and two nurses are present. Of the former, one operates, the other holds the patient's head. Of the latter, one sponges the wound, the other holds the child's hands. The table is about 18 inches wide, and is placed in a good light. Although the operation is usually completed by the sense of touch alone, it is important, if vision is to be used at all, to have the light in the proper direction, that is some distance beyond the end of the table, so as to shine into the wound, even when the patient's head hangs over the end of the table. The instruments got ready are a small knife, which must be quite sharp, dilators, membrane forceps, scissors, spring forceps, and two or three sizes of Parker's tubes, according to the age of the patient. If under one year, a No. 18 and No. 20 ; from three to four years of age, a No. 22 and 24. No hooks nor retractors of any kind are used.

When the instruments are boiled, the child is placed on the table, lying symmetrically, with the shoulders resting on a small sandbag or rolled-up towel. The head is then thrown back. If necessary, the child is brought so far to the edge of the table that the head hangs an inch or two over. The first assistant sits at the patient's head, and symmetrical with the patient ; his duty is to hold the head firm and to keep an eye on the body to see that no twisting occurs. One of the nurses takes the hands, with due care for symmetry, and stands well to the foot of the table, out of the way of the operator, who now defines the position of the parts and makes his incision, steadying the skin and trachea by the thumb and finger of his left hand, placed one on each side of the child's larynx. Laterally he is entirely guided by the median line,

unless a prominent vein projects, when he avoids the latter as neatly as he can. The upper end of the wound he makes about an eighth of an inch below the cricoid cartilage. Usually, in fat children, the cricoid cannot be distinguished by touch, but one can always feel the hyoid bone and thyroid cartilage, from which one can estimate the cricoid. The wound is made from $\frac{1}{2}$ to $\frac{5}{8}$ of an inch long, just large enough to comfortably admit the left forefinger. If the knife is sharp and the stroke firm, this incision will divide the deep fascia ; more commonly the cut has to be repeated once or twice to do this. As soon as the trachea can be distinctly felt with the left forefinger, it is opened by a stab and cutting movement. Most operators reverse the direction of the knife to do this, stabbing the lower angle of the wound and cutting upwards. I introduce the knife on my forefinger as a guide, and, before stabbing, guard it at a certain length by grasping the knife between thumb and first finger, and placing my middle finger projecting so as to leave about one inch of blade exposed.

The amount varies in different cases ; one often judges the depth of the wound too short, and has to repeat the cut. In these details, and many of those that follow, I find a great deal of variety of practice between different operators.

As soon as the trachea is opened, bubbles of air appear in the wound ; usually also there is some bleeding, though, in many cases, this was present from the first cut. Not infrequently, the latter is copious ; and if the patient is much cyanosed, or if he coughs badly, the venous blood is under pressure, and a cut vein will spout blood like an artery. The subsequent management of the operation proceeds in the same manner, with very few exceptions, whether bleeding is present or no, our efforts are directed to re-establishing free respiration, when the bleeding ceases of itself, or at least diminishes to a slight oozing, which is quite innocuous. At this stage, I always replace my left forefinger in the wound, where it acts as a complete plug, preventing blood from entering the trachea, while my right hand is laying down the knife, and taking the dilators. The slight pressure thus exercised often makes the respiration a little more difficult.

The same finger, feeling the cut cartilages, acts as a guide for the insertion of the dilators. As soon as the latter are

inserted, pressure on the handles causes the blades to open, the patient usually gives a great gasp, coughing out much mucus, and, occasionally, more or less complete casts, followed by a few deep inspirations. His colour at once improves, and often the deep breathing is succeeded by a period of apnœa, sufficient oxygen having now been absorbed for the immediate needs of the body.

Immediately on opening the dilators, in cases with profuse bleeding, the assistants, holding the child, slide him along the table till his head hangs right over the end. In this attitude the blood drains freely away and can do no harm.

If the respirations are satisfactory, the tube may be at once inserted, but, in many cases, the child continues to cough, and evidently has some obstruction. In some cases, loose flapping pieces of membrane can be seen, which should be seized just as they appear. In these cases, we insert the membrane forceps, with which sometimes a cast can be seized and brought up. After this, the tube is inserted and tied in.

If the bleeding continues free, it is as well to insert the tube at once, which has the double effect of reducing the cyanosis, and therefore the venous pressure, and of blocking the entrance of blood, if it still flows from the trachea. The completion of the operation also allows the child to rest, and hence leads to cessation of bleeding.

It is as well here to diverge from the description of the the operation, as properly performed, to the phenomena that attend the entrance of blood into the trachea. This is more likely to happen, if the patient is greatly cyanosed before the operation.

The venous pressure is then high, and any vein cut will pour out blood in torrents. To attempt to locate the bleeding point, and seize it in the ordinary way, would, I believe, generally be futile. If blood, in any quantity, is allowed to enter the trachea, it probably prevents air from entering. It excites coughing, and, if in sufficient quantity to keep the air out, of course the patient gets more cyanosed. Both the coughing and the cyanosis cause increase of venous pressure, and hence increase of bleeding.

The danger only arises between the moment of incising the trachea and the insertion of the tube, and I think that

it can be completely obviated by plugging the opening with one finger, before the dilators are in, and by putting the patient's head downwards immediately afterwards. Some operators, however, usually leave the knife in the wound after the first cut, and use it as a guide in inserting the dilators.

I think it wise to give here the reasons, which seem to me to justify those details of our technique, which differ from the operations most usually described.

(1) Absence of anæsthetic. An anæsthetic was always given at this hospital 12 years ago, when I first joined, unless the case was considered too dangerous, but was gradually discarded as unnecessary. I can speak with considerable experience, as my part was generally that of anæsthetist. To give chloroform to a child suffering from dyspnœa, will usually cause much increase of distress, and not seldom a condition of actual terror. The administration is often long, the patient sometimes getting drowsy soon, but waking up if the operation is begun. If given up to the point of full anæsthesia, the heart is probably always somewhat weakened, and the cyanosis also increased. In the opinion of those who used it here, the risk of death upon the table was sensibly greater with than without chloroform. And as regards operation without chloroform, although it may sound brutal, I am convinced that the distress to the child caused by the pain is, in most instances, less than that of giving chloroform.

(2) Operation without retractors or hooks of any kind. This depends entirely upon the use of the sense of touch. If an operator wishes to see the trachea before he opens it, retractors are necessary, also a wound of from $1\frac{1}{2}$ to 2 inches.

(3) The lack of distinction between high and low operations. As the parts are not dissected out, the isthmus of the thyroid is never seen, hence the distinction of these operations is lost. Free bleeding sometimes occurs after the last cut, but not so frequently as from veins in the superficial fascia.

(4) The neglect or apparent neglect of hæmorrhage. Probably, if hæmorrhage never took place, no patient would ever die under the operation, unless he was actually on the point of death at the time. Such deaths as take place are usually due to the entry of blood into the trachea, and the vicious

circle described above, and, against this, I have found the stopping of the wound with the finger a very complete protection until the dilators are in. After that the shifting of the patient over the end of the table acts almost as efficiently.

Choice of Operations.—I am a strong advocate for the short operation, as I believe its advantages to be real, and its alleged disadvantages to be mostly ill-founded. The former are as follows :—

(1) Quickness. The operation by one cut is the quickest, being over in a few seconds ; but I have never practised this. That by two cuts may, in favourable cases, take only a few seconds, but may take several minutes.

(2) Smallness of scar. There is no comparison between the scars left by operations, performed at my own hospital, and those in cases operated on at other institutions, and sent on to us to complete their cure. In female patients this may be a point of importance in after life. At the time, there is probably less septic absorption from the small wounds.

(3) Less necessity for using chloroform, the administration of which, I am sure, increases the risk.

(4) No necessity for introducing any instrument but the knife into the wound until completion. Hence no risk of pushing the trachea away from the middle.

The advantages claimed for the slower operation, by those who practise it, are :—

(1) Slow and sure. In very few cases is a period of ten minutes a real danger to the patient, in most not even twenty. Hence quickness is a minor advantage for the other method, and should not counterbalance the extra safety due to distinguishing the different landmarks at each step of the operation.

(2) Risk of hæmorrhage avoided by stopping bleeding from each source as it occurs.

(3) Safer for novices than the other, which is allowed to be a more “brilliant” operation, fit only for experts.

Against these contentions, my own experience of operating by sight, which I have formerly practised and also assisted at, is that slowness and caution do not give any added freedom from risks, as difficulties are apt to crop up in proportion to the time occupied. Even hæmorrhage occurs frequently, and

may give great trouble to control. In particular, I have many times seen large veins removed, as the operator thought, from danger by the use of the retractors, only to be cut into a moment later, because the pressure of the instrument had obliterated them and rendered them invisible.

The real risks of the operation lie as much in the mental nature of the operator, as they do in the condition of the patient. Though the risk of death upon the table is a reality, even with the most practised operators, the risk is greater, if the surgeon gets flurried and loses his head. At my own hospital I find that most novices get readily into the way of using the short incision, and finding the trachea by sense of touch alone. For the general practitioner, who is forced to operate, perhaps, for the first time in his life under unfavourable conditions, I would recommend the same method, but only on condition that it did not destroy his self-confidence. Some men will be frightened "to work in the dark," while others would not lose their power to discriminate the trachea from all other structures by touch, even in the anxious moments that are apt to occur in the middle of this operation. To such I confidently recommend the method described above, as giving, on the whole, less difficulties to overcome.

Difficulties of the Operation.—(1) In finding the trachea. This may be due to the trachea being pressed aside from the middle line, which is more apt to occur with long incisions, owing to the increased mobility thereby given; or from wrongly estimating the depth of the wound. In some children the trachea lies much closer than in others. It is especially in small babies, with fat necks, that one finds the trachea deeper than one expected. Also the depth increases the further one gets from the larynx.

(2) In getting in the dilators and tube. This may be due to (a) too short an incision, or (b) an incision to one side. The former can be enlarged. If large enough to contain the dilators, but not the tube, the top or bottom of the incision can be notched, while the dilators are in position.


If, however, the wound is one-sided, the usual result is for it to involve chiefly the cartilages, and only perforate the mucous membrane to a very short extent. Expiration

takes place through the hole, but not inspiration, nor can any instrument be inserted. Yet, to the finger, the cut cartilages give the impression of a wound of the proper length. However, the presence of the signs mentioned is almost diagnostic, and, having once suspected the condition, the operator will have no difficulty in making certain by his finger. Then the only course is to make a fresh stab in the middle line, after which no difficulty will be found.

(3) Insufficient relief to respiration. This may be due (a) to the tube not having been properly inserted. This is generally obvious by the character of the breathing. In case of doubt, the operator can cautiously plug the opening of the tube by one finger, when, if the latter is outside the trachea, no change in the respiration will occur.

(b) To obstruction lower down. This may be due to loose casts, which can be hunted for with forceps, or to membrane lining the smaller bronchi, in which no treatment has any immediate result. Large doses of antitoxin are indicated, even up to a total of 50,000 units.

(4) Heart failure. In ordinary cases, even should the patient have ceased breathing before or during the operation, artificial respiration will bring him round. Twelve hours later, his condition will be indistinguishable from that of a case who has not so closely approached death. But, in a few cases, the heart is on the point of ceasing before the patient is placed on the table, and actually stops either in the early stages of the operation, or as a consequence of difficulty occurring between the opening of the trachea and the insertion of the tube. In some cases, the loss of a single inspiration is enough to determine this, and not the most expert operator can guarantee to avoid this interference with the normal rhythm. The real remedy against such an accident is never to postpone operation until the heart is exhausted.



THE BACTERIOLOGY OF SCARLET FEVER.

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THE point at issue may be expressed in the form of a question:—Is scarlet fever primarily due to streptococcal infection, or do these micro-organisms only represent a subordinate or secondary infection, the micro-organism primarily responsible for the disease being still unknown?

This difficulty in deciding the precise significance of streptococci isolated from scarlatinal cases has been due, in the first place, to lack of precise information with regard to the group of bacteria presenting the general morphology of streptococcus. In this respect, our knowledge of the streptococcus group has been in great contrast to our knowledge of bacilli; for it is more than probable that had the bacteria found in scarlatinal tissues been bacilli, their significance would have long since been decided. Of recent years, however, owing to their value as indices of pollution derived from the human body, no less than to their first-rate importance as disease-producing agents in general, streptococci have been extensively studied with a view to determining the particular characters wherein they differ *inter se*. As a result, it has now been found that the streptococcus group, so far from consisting solely of transient varieties of a single species, as was generally imagined at one time, includes a number of quite distinct micro-organisms, the characters of which are sufficiently definite and lasting to permit of these micro-organisms being differentiated from one another with comparative ease.

Another impediment to our arriving at a complete understanding of the ætiology of scarlet fever lies in the fact that the most characteristic features of this exanthem, viz., the rash, angina, desquamation, etc.—in short, those lesions that go to comprise the clinical picture of a typical case—are not communicable to the ordinary animals of the laboratory. As an aid to the correct understanding of the ætiology of scarlet fever, therefore, still more valuable than our slightly improved knowledge of the streptococcus group is the knowledge now

available as the outcome of closer scrutiny of the mode in which the human organism responds to attack by pathogenic bacteria. The result of serotherapy and vaccination in scarlet fever, no less than observation of the opsonic index, and possibly of other qualities of the blood, should eventually go a long way towards settling the point at issue, and providing that array of conclusive evidence needed to decide those who have hitherto preserved an open mind with regard to the pathogenic agent of this disease.

In the following paper, I propose to refer, as briefly as may be, first to the result of the chief investigations which have been made with regard to the bacteria present in scarlet fever; secondly, to the results obtained by treating cases of scarlet fever with the serum of horses immunised against the streptococcus obtained from fatal cases of this disease; thirdly, to some observations which have been made in Russia with a vaccine prepared from sterilised cultures of this micro-organism. Lastly, I shall refer to a recent investigation of the opsonic index in scarlet fever.

THE BACTERIA PRESENT IN SCARLET FEVER.

So long ago as 1876, Dr. Klein, in the Report of the Medical Officer of the Privy Council, described the occurrence of masses of micrococci on ulcers of the throat in scarlatina. In 1884, Heubner and Bahrt found, in a case of scarlatina complicated by retropharyngeal abscess and suppuration of the finger and knee joints, a streptococcus identical in form with *S. pyogenes*. No cultures were made. In 1884, and again in 1887, Löffler found, in cases of scarlatinal diphtheria, in the throat and organs streptococci which he cultivated and examined. As he was unable to distinguish these streptococci from micro-organisms of the same type derived from cases of pure diphtheria, and as he was also unable to distinguish them either from *S. pyogenes* or from the streptococcus of erysipelas, he concluded that the streptococci which occur in scarlatina, as in diphtheria, are only accidental concomitants. In 1885, Fraenkel and Freudenberg, in three cases of scarlet fever in which the throat affection was severe, found present in the lymphatic glands, spleen, liver, and kidney a streptococcus. In cultures on agar, gelatine, and in broth, this streptococcus appeared identical with *S. pyogenes* of pus and

of puerperal septicæmia. They concluded that the streptococcus present was of secondary interest, forming a secondary invasion from the ulcerated part of the throat.

Down to 1885, therefore, while streptococci had been found in scarlet fever cases, no suggestion had been made that these were in any way different from *S. pyogenes*, or that they were other than secondary agents. Then occurred the Hendon outbreak, the circumstances of which were as follow:—

In December, 1885, Mr. Wynter Blyth, M.O.H. of Marylebone, observed a sudden outbreak of scarlatina in his district to be associated with the distribution of milk coming from a farm at Hendon. Sir William Power, the recent medical officer of the Local Government Board, found, on a more extended enquiry, that a similar prevalence of scarlatina had occurred in other districts supplied with milk from the same farm. After careful investigation, he was able to exclude with reasonable certainty any contamination of the milk from a human source; and he obtained the strongest evidence that the infection of the milk had originated from three cows, recently imported to the farm from Derbyshire. These animals were suffering from a disease characterised by the presence of sores and scurfiness in different parts of the skin; by loss of hair in patches, by an eruption leading to the formation of a sore covered with dark brown scab or crust on the teats and udder. The cows also showed visceral disease, notably of the lungs, liver, kidney, and spleen, and we are told that the visceral lesions very much resembled those occurring in cases of human scarlatina.

Sir William Power having convicted the cows, Dr. Klein proceeded to show that the disease could be experimentally transmitted to calves, and that it was caused by a certain streptococcus. Dr. Klein next investigated the bacteriology of human scarlatina, with the result that he obtained in four out of eight cases from the blood of scarlatina patients with ulcerated tonsils, during the period of eruption, a streptococcus which he identified culturally with the streptococcus of the Hendon cow disease. In the four positive cases, the temperature of the patient was at about its maximum when the organism was isolated from the blood. Dr. Klein also obtained the same organism in one out of three cases post-mortem

from the heart's blood. It was noted, among other things, that the streptococcus clotted milk, and also that its colonies on gelatine tended to develop nodules as time went on.

This streptococcus, derived from the human cases of scarlatina, was now inoculated into calves, and was found to produce the same disease as the streptococcus from the Hendon cows had done. Dr. Klein therefore contended that the streptococcus in question was the cause of scarlatina, and he termed it *Streptococcus scarlatinæ*.

In 1888, Lenhartz, in a fatal case of scarlatina, isolated from the fauces, cervical glands, internal organs, and also from the joints, a streptococcus, which he considered identical with *S. erysipelatis*, and, therefore, to play a secondary part in the disease. In 1889, Raskin examined 104 cases of scarlet fever. Sixty-four of these cases were uncomplicated, and in these bacteriological examination of the blood, during life, showed no streptococci. On the other hand, out of 22 cases complicated by suppurative processes, streptococci were present in 20, particularly in specimens taken from the suppurative inflammations. In the blood, on the other hand, streptococci were found in only two cases during life, and in the same number after death. In 18 cases, the skin was examined: streptococcus was found in only two. From their morphological and cultural characters, and from animal experiments, Raskin concluded that the streptococci obtained were identical with *S. pyogenes*, and had no bearing on the primary causation of scarlet fever. In 1889, Babes obtained a streptococcus from the kidney, post-mortem, in 13 out of 14 cases of post-scarlatinal nephritis. He also obtained the same organism from the other internal organs in these cases. He was unable to distinguish the streptococcus in morphological and cultural respects from *S. pyogenes*, and concluded that post-scarlatinal nephritis was caused by that organism. Babes also examined the virulence of streptococci isolated from scarlatinal cases, and observed that "the streptococci, obtained from mild so-called chronic cases of scarlatina, showed little pathogenicity for rabbits or mice, whereas those obtained from acute and rapidly-fatal cases proved to have great virulence for these animals." In 1889, Pearce of Boston made a bacteriological investigation of 23 fatal cases of scarlet fever. He concludes as follows:—

"In all these cases, *Streptococcus pyogenes* was the organism most commonly found. In some cases it occurred alone, and in others was associated with other of the pathogenic cocci, generally the aureus, or with the pneumococcus. In cultures from the nose and throat the streptococcus was almost invariably present. Out of 11 cases, in which there was a general infection, the streptococcus was found in nine. In six of these it occurred alone, and in the other three with *Staphylococcus pyogenes aureus*. Nothing has been observed in the study of these cases that throws light on the ætiology of the disease. The streptococcus can only be considered as a secondary invader."

In 1891, Kurth described a streptococcus occurring in scarlatina, and, on account of the peculiar nature of its growth in broth, termed it *Streptococcus conglomeratus*. He found this organism in four out of twelve cases of scarlatina.

He obtained *S. conglomeratus* on one out of seven occasions when he examined the tonsil, but in all these cases other streptococci were present. From the pus of a cervical abscess he obtained it on another occasion. He failed to isolate it from an aural discharge which he examined.

In two out of six post-mortems he isolated *S. conglomeratus*. In one case, he got it from an abscess in the region of the right vocal cord, from the kidney, and from the spleen. In another case, he also isolated *S. conglomeratus* from the spleen. On the other hand, in several of these cases, examined post-mortem, he isolated streptococci that differed from *S. conglomeratus*. It appears, therefore, that on the whole Kurth obtained from scarlet fever cases streptococci which he could *not* identify with *conglomeratus* more frequently than he obtained that organism.

He examined as controls streptococci from various sources. Thus two specimens of the streptococcus of erysipelas were examined, and also streptococci from pus, blister fluid, pemphigus, gangrene, septicæmia, tonsillitis, and influenza. Finally, he examined streptococci obtained from five diphtheria autopsies. In all instances but one he found the streptococci to differ from *S. conglomeratus*. The exception was a streptococcus that came from the tonsil of a case of ordinary tonsillitis, and it showed some conglomeration in broth. He

was unable to come to any definite conclusion about this tonsillitis streptococcus, as it had been met with before he was acquainted with *S. conglomeratus* of scarlet fever.

Kurth practically limits his description of the cultural morphology of *conglomeratus* to its growth in broth. He lays great emphasis on its conglomerating tendency in that medium. No description is given of the microscopical appearance of its growth in other media, nor is its effect on milk described. It was pathogenic for white mice; death occurring either in a few days, or only after the lapse of many weeks. In the latter cases, local suppuration was produced.

Kurth was the first person to draw attention to the exceptional conglomerating tendency of a streptococcus occurring in scarlatina. It is a pity that he did not examine its effect on milk. In his conclusion, he did not venture to suggest outright that *S. conglomeratus* was causally related to scarlet fever, though he vaguely hinted at such a possibility.

In 1892, D'Espigne and Marignac obtained a streptococcus from the blood of a case of typical scarlatina that followed a surgical operation. They compared this organism at length with nine other streptococci from various non-scarlatinal sources, and came to the conclusion that it differed from them all.

One of the points of variance which they noticed was the appearance of the colonies on serum. The streptococcus from the scarlatinal case formed expanding, discrete colonies, whereas the other streptococci formed smaller colonies that were more confluent. The streptococcus from the scarlatinal case clotted milk, whereas the majority of the streptococci with which comparison was made, including two examples of the streptococci of erysipelas, failed to do so. They point out that in this respect their streptococcus resembled that described by Dr. Klein. They also pointed out that, in the rabbit's ear, the streptococcus from the scarlatinal case produced only a transient redness which cleared up very quickly and left no abscess, whereas the other streptococci produced either erysipelas or an abscess. In this point, also, they confirmed Dr. Klein, who had previously described this difference. D'Espigne and Marignac concluded that the streptococcus which they had isolated was a different organism to the other streptococci.

In a paper, published in 1895, D'Espigne relates the result of the bacteriological examination of further cases of scarlet fever. He isolated the same streptococcus as before from the blood twelve hours after the onset of the eruption, and at the acmé of the fever. He also isolated the same organism from the throat of the same case. In three other cases, examined on the second and third day of the eruption, he failed to get any growth from the blood. In three more cases, in which he made cultures from the tonsil, he obtained the streptococcus twice, and *Streptococcus pyogenes* once.

He compared the streptococcus with more streptococci from non-scarlatinal sources, with the result that he verified his former statements. He finds that the ability to clot milk by the streptococcus may be lost after several months. He further verified the fact that the common streptococcus only exceptionally clots milk. The virulence of the scarlatinal streptococcus varies, he found, and, accordingly, he thinks that it is of no differential value. His conclusion is as follows:—"The presence of a special streptococcus in the blood at the commencement of the eruption of a case of typical scarlatina deprived of all complications, is in favour of the idea that it is the main cause of scarlatina. This conception does not exclude the possibility of complications later, either local or general, due to the penetration through the tonsil of virulent *Streptococcus pyogenes* contained in the saliva."

This idea of a special streptococcus in scarlatina, bearing a causal relationship to the disease, received support from the observations of Curtois in 1899. Curtois examined urine from 97 scarlet fever cases, and found albumen in 42. Out of these 42 albuminous urines, 30, or 71 per cent., contained streptococci, whereas, in non-albuminous urines, streptococcus was only present in 27 per cent. As the result of these and other observations, he inclines to the view that the organism of scarlet fever is a streptococcus closely analogous to that of erysipelas.

In 1900, appeared one of the most extensive surveys of the bacteriology of scarlatina that has yet been published. The investigators were Professor Baginsky and Dr. Sommerfeld of Berlin. Reference is first made to former work of Baginsky's, in which he found that when, in the course of diphtheria,

scarlatina manifests itself, repeated bacteriological examination of the throat no longer revealed the presence of diphtheria bacilli, but the cultures contained only cocci. These cocci were chiefly streptococci, and their constant presence in scarlatinal angina led Baginsky to ascribe to them an ætiological relationship towards the scarlatinal process.

In the present research, the pharyngeal mucus was investigated in the first place. A microscopical examination was made, supplemented in a proportion of the cases by cultures. Altogether 363 cases were examined. In 356, only cocci, chiefly streptococci, were present. In 22, complicated by diphtheria, Klebs-Löffler bacilli were present with the cocci. In 5 cases besides cocci other bacteria were present. Cultures on serum were made in 62 cases with the following results:—4 cases gave pure cultures of streptococci; 29 gave mixtures of strepto- and staphylococci; and 29 cases gave streptococci mixed with other organisms, such as pneumococci, leptothrix, yeast; but never diphtheria bacilli.

In a case in which the blood and spinal fluid were examined during life, Baginsky and Summerfeld isolated from both materials a streptococcus.

A bacteriological examination was made in 42 cases of scarlatina post-mortem. The cases were divided into two groups:—

(a) Those in which the disease was so acute and progressive that death rapidly ensued—hence no “secondary” affections developed. Eight cases of this type were examined. They had succumbed in an average of 2–5 days from the onset. Two succumbed in 2 days, and two in 3, 4, and 5 days respectively.

(b) The second group comprised cases in which the course of the disease was less progressive, and “secondary” complications were present. The bacterial examination was made, as a rule, 2–3 hours after death. Cultures were made from the blood, spleen, kidney, liver, bronchial and mesenteric glands, and from the bone marrow (tibia). Broth cultures were made in the first place, and from them agar plates were made later.

The result was that in all the cases examined—both of the slow and of the rapid type clinically—a streptococcus was

invariably found. Its virulence was tested on guinea-pigs, white mice, and rabbits, and found to vary within wide limits. In some cases it was very virulent; in others apparently harmless. There did not seem to be any relation between the degree of virulence of the streptococcus and the clinical course of the disease.

They especially remark that the streptococcus obtained in these cases of scarlet fever exhibited marked "pleomorphism," the morphology depending to a considerable extent on the culture medium, according to which longer or shorter chains, diplo- or streptococcus forms prevailed. The streptococcus clotted milk at 37° C., and produced acid. It stained with Gram. They were unable to distinguish the streptococcus from other streptococci.

In spite of this, however, Baginsky and Sommerfeld stated in their conclusions that "many points seem to be in favour of the streptococcus being causally related to scarlatina." In support of this contention, they refer particularly to the fact that, in all the fatal cases examined, the streptococcus was invariably obtained from both the heart's blood and bone marrow, and was, moreover, obtained in pure cultures in those cases which were examined soon after death. Again, neither the case in which the streptococcus was demonstrated during life in the blood and spinal fluid, nor seven of the 42 fatal cases, in which the presence of the streptococcus was proved after death, presented any of the so-called "secondary" manifestations. Further, they maintained that the proved high virulence of streptococci, and their known ætiological relationship to morbid conditions of a septic character, were strong evidence in support of the view that this particular streptococcus was intimately concerned in the actual causation of the scarlatinal process.

Hektoen, in 1903, published the result of investigation of the blood in 100 cases of scarlet fever. He took $\frac{1}{2}$ -1 c.c. of blood and cultivated it in 100-150 c.c. of glycerinated broth, at least two flasks being used in each instance. He obtained the typhoid bacillus twice, once in a case wrongly diagnosed, and once in a case of double infection. He got streptococcus in altogether 12 cases. Unlike some other observers, who had tested blood by culture in scarlatina, he failed to find

B. *influenzæ*. He classifies his results as follows:—

—	Benign Cases.	Moderately Severe.	Severe.	Fatal.	Total.
Total Nos. - -	45	40	11	4	100
Streptococci present	4	5	3	0	12

In two of his four fatal cases, he recovered *Staph. aureus* from the blood during life. In one case, the staphylococcus seemed to have disappeared before death, and at the post-mortem the blood was sterile, while the spleen and liver contained streptococci. Hektoen was of the opinion that the primary microbe of scarlet fever has still to be discovered.

Practically all agree that the organism present is a streptococcus: it is with respect to its rôle that opinions are so widely different.

My own work at the bacteriology of scarlet fever has been carried out on behalf of the Local Government Board, and began in 1898. An examination of the tonsillar mucus in a number of cases of the ordinary mild type of scarlatina showed that cocci were constantly contained by it, and that streptococci in particular exceeded all other micro-organisms in abundance. Ten fatal cases of scarlatina were then examined in detail post-mortem. In nine of them, clear evidence was found that the patients had succumbed to streptococcal infection; in the other case, pneumococcus being concerned as well as streptococcus. In all these fatal cases the streptococcal invasion was traced through the cervical lymphatic glands to the mucous membrane of the tonsil and pharynx.

A detailed investigation was made of the characters of the streptococci found in the scarlatinal throat and tissues, with the means of differentiation then available; an examination being made of their morphology in broth, and on solid media, their ability to clot milk, and their virulence for mice. As a result, evidence was found pointing to two different streptococci being concerned in scarlet fever. One of these was present in the mucus on the scarlatinal tonsil in mild uncomplicated cases, possessed the capacity of clotting milk, and appeared to correspond with Dr. Klein's *S. scarlatinæ*, so far as that micro-organism had been defined. Its growth in broth

was often extremely conglomerate, so that the term "conglomeratus" of Kurth seemed apposite. A third feature of this microbe of the scarlatinal tonsil was its marked pleomorphic tendency, especially on solid media. In some cases, it formed bacillary elements and spindle shapes, which very closely resembled forms of *B. diphtheriæ*. In fluid media, however, the organism would, as a rule, consistently revert to the streptococcus form. The typical characters were not always exhibited: some strains would show a deficiency in one or more of the characteristic properties. The term *S. scarlatinæ* or conglomeratus was retained for this streptococcus of the scarlatinal tonsil. It was identified in the tissues in a minority of the fatal cases.

The other streptococcus could not be distinguished, either in morphological or cultural respects, from *S. pyogenes*. It was found to be much more virulent to mice than the preceding type. Quantitative investigation of the tonsillar mucus in mild uncomplicated scarlatina showed that, in a proportion of the cases, even at an early stage of the disease (second day), this streptococcus might be present together with *S. scarlatinæ* on the scarlatinal tonsil, though no clinical complications ensued. This pyogenes-like streptococcus was found much more frequently in the nasal and aural discharges of scarlatina than was *S. scarlatinæ*, and it was obtained from the tissues, post-mortem, in the majority of the fatal cases.

For the better understanding of these two streptococci, met with in scarlet fever, it was obviously desirable to make control observations, especially to investigate the normal throat, and the throat in disease processes other than scarlatina, to isolate the streptococci there present, and to examine them in the same way. Above all, it was desirable to examine the streptococcus group generally, and to determine whether streptococci might not possess further and more decisive characters by means of which they could be differentiated *inter se*.

These control observations showed that streptococci were the most abundant bacteria in normal saliva. Further, though *brevis* was the commonest, all the various morphological types of streptococci, including some specimens of conglomeratus type, could be obtained from normal saliva. No streptococcus identifiable in all respects, however, with *S. scarlatinæ* was

obtained in these control observations.

Investigation of the streptococcus group was now made, and the biochemical capacities of these micro-organisms examined in regard to a large number of organic substances. As the outcome, it was found that streptococci exhibit a marked divergency with regard to their ability to reduce neutral red, and to decompose certain substances, such as saccharose, lactose, raffinose, inulin, salicin, coniferin, and mannite, with an acid reaction. These points therefore promised to be useful for the purpose of differentiating and identifying streptococci.

As regards streptococci of scarlet fever, I was able to give the result of submitting five streptococci from scarlatinal processes to these tests, when describing them in 1905. Examples of streptococci from scarlatinal tissues were found to give readings similar to those given by some examples of *S. pyogenes*, viz. :—positive reactions in saccharose, lactose, and salicin. Another type gave positive reactions in these three tests and also in mannite.

Drs. Andrews and Horder, in the following year, 1906, published results obtained with streptococci isolated from the tonsillar mucus in scarlatina in these tests. They found the honours divided between a streptococcus of the *pyogenes* type, giving positive reactions in saccharose, lactose, and salicin only, and another streptococcus which decomposed saccharose and lactose only, but clotted milk, and reduced neutral red. For the latter streptococcus they proposed the name of *anginosus*.

The most extensive investigation of the streptococci in scarlatina that has yet been conducted with these tests has been made by Dr. Cumpston, whose results were published in 1907. A special feature of Dr. Cumpston's admirable paper is the care that he took to exclude salivary bacteria when examining the tonsillar secretion. To this end, he applied three swabs in succession, the first to absorb the saliva from the buccal cavity, the second to remove débris and loose secretion from the tonsil until the surface of this organ just began to bleed, when he applied the third swab, which was subsequently plated out. He examined altogether 101 streptococci from scarlet fever cases: 80 of these were obtained from tonsillar mucus coming from 25 patients, 24 of whom were between the second and ninth day of an attack of ordinary mild scarlatina. The result of examination of these 80 streptococci was that 40 of

them were found to give identical readings, viz.:—positive reactions in saccharose, lactose, and salicin only. He also examined 19 streptococci isolated from abscesses in scarlet fever, with the result that he found no less than 13 of them to give the same reactions as in the case of the chief tonsillar type just mentioned.

So far as the streptococci of scarlatinal tissues have been submitted to these tests, the chief streptococcus associated with the disease is one giving no clot, no neutral red reduction, positive in saccharose, lactose, and salicin, negative in raffinose, inulin, and mannite, and growing on gelatine at 22° C.

The same reactions in these tests are given by one of the commonest forms of *S. pyogenes*, isolated from disease processes of non-scarlatinal nature. Whether the pathogenetic values of these streptococci for the human organism are identical is not yet known.

SEROTHERAPY.

A number of antistreptococcic sera have been tried at one time or another in scarlet fever, but the only ones that call for attention are those prepared from streptococci isolated from scarlatinal tissues.

Moser's Serum.—The chief of these is the serum introduced by Moser, of Vienna, in 1902. It is made by immunising the horse against streptococci obtained direct from the heart's blood of the scarlatinal cadaver. It would appear that as many as 20 strains of streptococci from this source may be used for immunising a horse. A point of some importance is that the streptococci are not passed through animals before being injected into the horse. The dose in which this serum is given to patients is considerable, from 30–180 c.c. being administered at a time. It is, of course, desirable to use the serum as early in the disease as possible, and the dose may have to be repeated.

Pospischill, April, 1903, made a careful clinical study of severe cases of scarlet fever under treatment with Moser's serum. The dose given was 100–200 c.c. He reports that the serum appeared to bring about abatement of the symptoms by reducing the temperature, respirations, pulse, and cyanosis. It also appeared to constantly bring about a diminution of the

necrotic inflammation of the mucous membrane. Escherich, June 4, 1903, also reports favourable results with Moser's serum. His experience shows the necessity of inoculating patients, in the first days of the disease, with considerable doses of the serum, viz., 100-200 cc. He compared the cases under treatment with others in which the serum was not given, and concluded that it had an almost immediate action on the temperature. Without pronouncing on the nature of scarlet fever, Escherich considers himself justified in inferring that it is among the micro-organisms employed in immunisation of the horse. Bokay, January 4, 1904, reports that he has treated 12 cases, more or less severe, of scarlet fever with this serum, using 100-200 c.c. as a dose. In two cases, he was obliged to give two doses at an interval of 24 hours. In all cases, amelioration of symptoms followed injection—fall of temperature and pulse, the eruption improved, and the serum produced a favourable effect on the throat, kidneys, and ears. He witnessed no harmful effect from the serum, and agrees with Moser and Escherich that its favourable action is due to its antitoxic properties. In a later communication, September, 1905, Bokay, having tried Moser's serum in 17 more cases, confirms his previous favourable report, and adds that the injection of large doses of Moser's serum has no noxious action on the kidney; instead of aggravating albuminuria, it often diminishes it. He notes the delayed appearance of serum rashes in some cases (27th to 42nd day). Ganghofer, of Prague, April, 1905, however, failed to get the striking effects reported by Moser, Bokay, and others, as he lost 5 out of 8 cases of scarlatina treated by him. He admits, however, that the mortality can be ascribed in part to late intervention, and that, in two cases, the serum appeared to exercise favourable action. Schick, December 28, 1906, after recalling the contradictory opinions expressed on the subject of the application of serum in scarlatina, cites the opinions of Russian clinicians, who are almost unanimous in extolling the curative virtues of Moser's serum. Fresh observations, made in the clinique of Vienna on 60 patients, go to corroborate the favourable opinion expressed by Bokay.

Charlton's Serum.—Charlton, of Montreal, October, 1902, whose bacteriological studies of scarlet fever had led him to realise the important rôle of streptococci in producing the

severe symptoms in this disease, reports that, independently of Moser, he had been using a serum made in similar manner from a streptococcus isolated from scarlatinal tissues. He had used this serum in 15 cases, all severe, and the majority of them would, under ordinary treatment, in his opinion, if they had not terminated fatally, at least have suffered from complications. The serum does not, in Charlton's view, cure scarlatina; for he holds that the streptococci are secondary to some micro-organism still unknown; but he claims that its timely administration, in severe cases, tends to allay unfavourable symptoms, overcomes complications, and that, given in an early stage of the disease, it prevents a fatal termination.

PALMIRSKI AND ZEBROWSKI'S SERUM.

Perhaps the most striking evidence in favour of the value of antistreptococcus serum in scarlet fever, when prepared with a streptococcus isolated from the scarlatinal tissues, is contained in a paper published by these investigators in 1905.

These Russian authors altogether reject the theory of an infection with an unknown organism in scarlet fever, and boldly assert the specific micro-organism to be *S. conglomeratus*. They base this opinion on two grounds—first, on the result of observations made with regard to the micro-organism itself; secondly, on the result of their experience in treating the disease with horses immunised against it.

As regards the micro-organism itself, they find that the streptococcus of scarlatina has but feeble virulence. It requires 5 c.c. of a broth culture of conglomeratus to kill a rabbit. Moreover, passage of numerous generations (24) of the streptococcus through rabbits does not increase its virulence. As regards antistreptococcus serum, they confirm Moser's experience that Marmoreck's antistreptococcus serum has no curative action in scarlatina.

On the other hand, serum of horses immunised against *S. conglomeratus* has manifested very distinct curative properties. The serum is equally efficacious if prepared from one strain coming from one case of scarlatina, or with a mixture of streptococci coming from divers cases. A feature of the serum is the large dose of coccus given to the horse when immunising it; beginning with $\frac{1}{2}$ c.c. of sterilised broth culture,

the dose is progressively increased to 300 cc.

Palmirski and Zebrowski have applied the serum in about 1,000 cases, but they only take into consideration 133 cases of severe type. In all of these cases the action of the serum was manifested by amelioration of symptoms, quieting of the nervous system, and a fall of body temperature from 1-4 degrees. It failed to act to the same extent in complications of scarlet fever, *e.g.*, when *S. conglomeratus* had been already found in the blood, and in adenitis of the submaxillary lymphatic glands, or otitis. It seems, on the other hand, to act upon the nephritis, the percentage of which seems to have fallen from 25 to 3. They deny Moser's claim that the serum abates the rash.

The mortality of children treated with this serum was 15 per cent., whereas from hospital statistics for these severe cases the mortality without it would be 60-70 per cent.

The dose is 25 c.c. for children of 1-2 years, and 50 c.c. for older children and adults.

VACCINATION.

The history of vaccination, which is only of recent application in this disease, and which has apparently been tried in Russia alone up to date, is briefly as follows :—

In 1906, Gabritchewsky, of Moscow, introduced a vaccine with a view of preventing scarlet fever. The vaccine consisted of a culture of the streptococcus, found in the blood in fatal cases of this disease, that had been sterilised by heating it to 60° C. Each c.c. of the vaccine contains the equivalent of 5 milligrams of dry cocci. He begins by injecting 0.5 c.c., then repeats the injection twice, increasing the dose somewhat on the second occasion.

In his first paper, he reports the effect of this vaccine on 700 children. In a certain number of cases (13.3 per cent.), the injection was followed by an eruption much resembling that seen in scarlet fever. He failed, however, to observe desquamation. Sometimes angina was induced, and sometimes vomiting. He sees in these symptoms new and important arguments in favour of the specificity of this streptococcus found in scarlatina.

Zlatogoroff, of St. Petersburg, August and September, 1906, tried the streptococcus vaccine on 530 persons. He found that, four to eight hours after the injection, in a proportion of the cases, there is pain at the site of inoculation, and after 14 to 18 hours, redness and swelling. The latter disappears after

24 to 48 hours. In some cases the injection is followed by the development of a punctiform erythema, lasting 24 to 56 hours. In some cases there was a slight rise of temperature, which lasted one to three days. Zlatogoroff is hopeful that the vaccine, if it does not prevent scarlatina, will, at any rate, prevent the grave complications of that malady.

Langowoy, of Moscow, October, 1906, reports the result of employing the vaccine on 120 children. He observed much the same effects as Gabritchewsky and Zlatogoroff, with regard to the local reaction and slight rise of temperature. In a certain number of children he observed, 24 hours after the injection, the development of a rash so characteristic of scarlatina as to raise the question whether the case was an incipient one of that disease. In some cases, the pharyngeal mucous membrane was red and scarlatiniform; in others, the angina was trifling, or absent. The eruption, as also the angina, might last two or three days, though the general state of health remained excellent and the pulse normal. He never observed desquamation.

Gabritchewsky, May, 1907, brings formal evidence with a view to showing that the streptococcus is really the specific agent of scarlatina, on the ground that the symptoms observed in some of the vaccinated cases recall the prominent symptoms of scarlet fever.

He has made a long study of the scarlatiniform erythema, which several observers have testified to follow injection of this streptococcus vaccine, and maintains that this erythema is identical with that of scarlet fever. Moreover, the rash is stated to be often accompanied by symptoms such as desquamation, angina, lymphadenitis, and albuminuria; symptoms so characteristic of scarlatina. Five children who had undergone scarlatina before vaccination failed to show any reaction. He maintains that no other vaccine (cholera, plague, typhoid) produces symptoms like those which follow injection of his anti-scarlatinal vaccine; and that the same lack of correspondence holds with regard to injection of streptococci other than that of scarlatina.

THE OPSONIC INDEX.

The opsonic power of the blood, during an attack of scarlet fever, in regard to streptococci, has been investigated

by A. G. Banks, 1908.

Banks used four cultures of streptococcus in these observations. Two of them had been isolated from the scarlatinal tonsil in practically pure culture, and exhibited conglomerative tendency, bacillary forms, and clotted milk. They were, therefore, clearly specimens of *S. scarlatinae*. The third streptococcus came from a case of meningitis, secondary to mastoid disease. It did not clot milk, and was probably *S. pyogenes*. The fourth streptococcus came from an abscess that developed during scarlatina. Banks found that these streptococci behaved alike in the opsonic sense.

He first set himself to determine the variation of the opsonic index to streptococci shown by normal serum, and found that the index varied between 1.2 and 0.8. The opsonic variation of normal serum to streptococcus was, therefore, of the same compass as in the case of the tubercle bacillus, and *Staphylococcus aureus*. He then proceeded to determine the index in scarlet fever. He examined, in this way, 5 cases of mild uncomplicated scarlet fever, 3 fatal cases, and 4 cases that developed nephritis. His conclusions are as follows:—

1. In cases of scarlet fever, running a fairly normal course, the opsonic power varies in a pretty definite and constant way. It is decreased during the early febrile period, and rises to normal, or above normal, with the deservescence and general decline of symptoms, etc.

2. In fatal cases, with severe angina, the opsonic power is markedly subnormal.

3. Complications alter the curve. Thus the opsonic power is decreased at the onset during the earlier period of albuminuria, severe nephritis, and secondary adenitis. As convalescence is established, the quantity of opsonin rises.

4. Support is lent to the view that nephritis is due, mainly if not entirely, to streptococcal invasion of the body.

5. The opsonic index furnishes few data for prognosis.

6. A definite relationship to the *Streptococcus scarlatinae* has been demonstrated, but there is no striking difference in the results obtained with typical and atypical varieties, respectively, of this organism.



THE BACTERIOLOGY OF DIPHTHERIA.

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PHYSICIANS, from the earliest times, seem to have had a more or less general conception of the disease, which we now call diphtheria. Aretæus gave a characteristic description of it, and, among other things, states¹ "At si in pectus per arteriam id malum invadat, illo eodem die strangulat. Pueri usque ad pubertatem maxime hoc morbo tentantur." In 1765, Home, a Scotchman, tried to show that "croup" and pharyngeal diphtheria are distinct affections, while Samuel Bard, an American, in 1771, supported the view of their identity. It is of course to Bretonneau that we owe the first accurate description of diphtheria, as well as the name applied to the disease. He states that all writers of the seventeenth century regarded diphtheria as contagious, and he himself clearly recognised its contagious nature, and regarded it as transmitted by inoculation, for he remarks²: "Innumerable facts have proved that patients cannot contract diphtheria, unless the diphtheritic secretion, in the liquid or pulverulent state, is placed in contact with a soft or softened mucous membrane, or with the skin, on a point of denuded epidermis, and this application must be immediate."

Laycock is stated to have been the first to hint that diphtheria is caused by a vegetable parasite, and Klebs, in 1883, showed that bacilli of a peculiar character are constantly present in the pseudo-membrane. One year later, Löffler not only confirmed the observations of Klebs, but succeeded in isolating the bacillus, and by inoculation experiments with pure cultures produced the characteristic pseudo-membranes, paralyses, and death in animals. The bacillus isolated by Löffler, the *Bacillus diphtheriæ*, is frequently termed the Klebs-Löffler bacillus, thus recalling the prominent part taken by

¹ *Memoirs on Diphtheria*: New Sydenham Soc. Bretonneau's Second Memoir, p. 28.

² *Ibid.* Fifth Memoir, p. 176.

these two investigators in elucidating the nature of the specific virus of diphtheria.

The *B. diphtheriæ* may be readily isolated by the employment of a special culture medium, Löffler's blood-serum, which consists of a mixture of blood-serum (ox serum was that originally used) 3 parts, and glucose bouillon 1 part, the whole being coagulated. On this medium the diphtheria bacillus grows and multiplies exceedingly well, while the other organisms, associated with it, are to a large extent inhibited in their growth. By rubbing a small piece of membrane from a case of diphtheria over the surface of two or three tubes, or of a plate, of Löffler's serum, and incubating at blood heat for twenty to twenty-four hours, colonies of the diphtheria bacillus will be found, more or less isolated, according to the number of organisms present in the membrane, and, by subculturing from these, pure cultures may be obtained.

The *Bacillus diphtheriæ*, thus isolated, takes the form of delicate, often slightly curved, rods averaging $3-4\mu$ in length, but the size is very variable, ranging from $2.5-5$ or 6μ in different cases, and three varieties have been described, the long, the medium, and the short.

Some of the rods, both in cultures and in the membrane, are usually somewhat swollen at one end, the so-called clubbing, and parallel grouping, both in the membrane and in cultures, is almost universal, the bacilli lying parallel side by side. Distinct thread and branching forms, though of rare occurrence, may be met with, and it is very common for the bacilli to be joined end to end in a series of twos. On different media the size is very variable. On blood-serum and on gelatine the bacilli are of medium length; in broth they tend to be short and stunted; while on agar, especially glycerine agar, they are much larger than on the former media. Variations in form are also almost invariably met with on culture media. This is especially marked on glycerine agar, long club-shaped and spindle-shaped rods being abundant; on blood-serum they also occur, but sparsely in a young, 18 to 20 hours' culture, in a 48 hours' culture more numerous. The organism is non-motile, does not form spores, and is aerobic and facultatively anaerobic.

The *B. diphtheriæ* stains well with the aniline dyes and

by Gram's method, the most characteristic appearance, perhaps being obtained by staining with Löffler's methylene blue. The colouration is usually somewhat irregular, more deeply stained portions alternating with paler intervals, the so-called segmentation, and especially marked with agar cultures. The ends of the organisms are also frequently more deeply stained than other parts, the so-called polar staining, while the phenomenon known as "metachromatism" is often marked both at the poles and also in the rod, appearing as granules of a purplish tint, and contrasting with the blue of the methylene blue. With Neisser's stain, deep inky coloured dots, appearing somewhat larger in diameter than the rods, occur at the poles of the organism and occasionally at the centre.

The *B. diphtheriæ* grows readily on the ordinary culture media, particularly blood-serum and glycerine agar. It flourishes well in milk with the production of a small amount of acid but without other change, so that an infected milk would be quite unaltered in appearance.

The *B. diphtheriæ* is agglutinated by the serum of patients and by a diphtheria serum, but the test is difficult to apply on account of the coherence of the growth, is somewhat erratic with different strains, and is of no practical value in the diagnosis of the disease, and little for the recognition of the organism, and for distinguishing it from the so-called "pseudo-diphtheria" bacilli.

It retains its vitality in cultivation for a month, and, when dried, for three or four weeks. According to Welch and Abbott, it is destroyed in ten minutes by a temperature of 58° C. It is readily destroyed by antiseptics when in cultivation, but in the membrane it is difficult to find an agent, which will penetrate, and kill the bacilli beneath the surface.

The diphtheria bacillus is pathogenic for man, the horse, ox, rabbit, guinea-pig, cat, chicken, pigeon, and finches, which are all more or less susceptible, while mice and rats are immune. In man, the respiratory tract is usually affected, though the conjunctiva and other mucous membranes, as those of the vagina and stomach, and wounds may be attacked. A membrane, as a rule, forms, consisting of laminæ of fibrin entangling a few leucocytes and other cells, and here and there small effusions of blood, with coagulative necrosis of the underlying

mucous membrane, and in this membrane the bacilli are for the most part located in the superficial layers, though in all cases, in which the disease has lasted for any time, they are found in the lungs, spleen, and kidneys, and may occur even in the blood. The disease, in the earlier stages, at least, is a toxæmia,—an intoxication produced by toxins, elaborated at the local site of infection, and absorbed into the system. If the patient recovers from the diphtheritic attack, paralytic sequelæ are far from uncommon, and are due to a peripheral neuritis caused by the toxins. Membranes may be formed by other organisms (see below), but it is doubtful whether paralytic sequelæ follow any but a diphtheritic infection.

Some remarkable skin affections of an eczematous or ichthyomatous nature have been found, by Hare and others, to be due to the diphtheria bacillus.

Another condition, which seems to be generally diphtheritic, is membranous rhinitis. Whereas true nasal diphtheria is a most serious condition, membranous rhinitis is seldom, if ever, attended with any risk to life, sequelæ do not occur, and it is rare to obtain a history of infection from cases of it. This is extraordinary and very difficult to explain, for the nose and nasal secretions swarm with virulent diphtheria bacilli.

The relationship of diphtheria and membranous croup has in the past been a vexed question, but it is now generally recognised that membranous croup is almost always laryngeal diphtheria, and it is interesting to note how this change has affected the mortality returns published in the Registrar-General's Reports. Thus the mortality, in England and Wales per million living, was in—

1861-70, from diphtheria,	185 ;	from croup,	246
1871-80, " "	121 ;	" "	168
1881-90, " "	163 ;	" "	144
1891-95, " "	254 ;	" "	70
1896-1900, " "	272 ;	" "	34
1901-05, " "	204 ;	" "	16

from which it will be seen that "croup" as a cause of death is disappearing from the mortality returns.

Diphtheroid organisms can occasionally be isolated from apparently healthy people, and those not known to have been in contact with diphtheria cases. The Klebs-Löffler bacillus

can be isolated from the throats of nearly 7 per cent. of the presumably healthy population, but in the throats of contacts the percentage rises to 33 or more. Murray and the writer found diphtheria-like bacilli in 58 out of 385 children (15 per cent.) admitted into the Victoria Hospital, Chelsea.

Ford Robertson believes that diphtheroid organisms—possibly the Klebs-Löffler bacillus itself—may play an important part in the production of general paralysis of the insane. His views have not gained general acceptance, and Eyre found that the percentage incidence of all diphtheroid organisms, and of the true *B. diphtheriæ*, in the throats of the insane was not greater than in healthy persons, and was unable to isolate the latter organism, post-mortem, from cases of general paralysis.

Other micro-organisms are frequently associated with the diphtheria bacillus in the throat, principally staphylococci and streptococci, and they may play an indirect rôle by preparing the part for infection with the *B. diphtheriæ*, or a more direct one in causing the fœtid, sloughing condition sometimes accompanying the disease. It has been stated that the larger varieties of the diphtheria bacillus are more virulent than the smaller ones, but this is by no means a universal rule.

The bacteriological diagnosis of diphtheria is based on the recognition of the *B. diphtheriæ* in stained smears, or in serum-cultures made from the membrane or exudation. The method is of very real assistance in doubtful, and especially in mild, cases, in which, clinically, it might be very difficult to say whether the condition is diphtheritic or no. The mild cases are those which it is of the greatest importance to identify, especially in schools, for, if not recognised, the patients may go about and prove a source of infection to all around. The method also affords valuable evidence as to when a case can be considered free from infection; so long as bacilli are present in the throat, infection must be possible, and the length of time for which they may occasionally persist, is remarkable. In half the cases, the bacilli disappear within three days of the disappearance of the membrane, in a few cases they linger for as long as three weeks, but they may persist much longer. The writer isolated them for as long as five months (and virulent

to the last) ; and a case is recorded, in which they persisted for no less than fifteen months after the attack. In all cases, two or three examinations should be made at short intervals with negative results before the bacilli can be pronounced to be absent, and no case should be discharged from hospital until the absence of bacilli has thus been proved. In fact, the writer regards the bacteriological examination as being of more value in what may be termed a public health sense, *i.e.*, for the protection of the community, than for clinical diagnosis, though very useful confirmatory evidence in the latter, for in no case, where there is a reasonable suspicion of diphtheria, should treatment with antitoxin be delayed until the bacteriological report is obtained.

With regard to the value to be attached to the bacteriological examination for diphtheria, while the finding of the bacilli is proof positive of the diphtheritic nature of the affection, and of its infective nature, their absence is not of so much value, as various circumstances modify the result. For example, an unskilled person may not happen to touch the right spot with the swab, or, from struggling on the part of the patient, even a skilled operator may fail to reach any but a small portion of the mucous membrane, instead of obtaining a good mop from all over, especially when there are no definite patches of membrane. The use of antiseptic gargles or paints, shortly before the swabbing is taken, will likewise prevent the growth of the bacilli. It sometimes happens that a very mixed growth is obtained in the cultures, and, in such cases, the Klebs-Löffler bacillus may be missed.

Having thus briefly considered the bacteriology of diphtheria, the question of diphtheria-like diseases, and of the pseudo-diphtheria bacillus may be discussed.

Although anginal affections with pseudo-membranes are usually diphtheritic, other organisms undoubtedly occasionally give rise to similar appearances ; such are the streptococcus (*S. anginosus* of Andrews and Horder), the pneumococcus, the pneumobacillus of Friedländer, and possibly others. Vincent's angina also simulates diphtheria, and is infective, but in smears, made from the exudate, large, deeply staining, fusiform bacilli, and delicate lightly staining spirillar threads are seen, and are characteristic, while the diphtheria bacillus can be neither

detected nor cultivated. The so-called diphtherias of the lower animals—pigeons, fowls, and calves—have also nothing to do with human diphtheria, and the causative micro-organisms are quite distinct from the Klebs-Löffler bacillus. Cats, and possibly horses and cows, are the only animals which, now and then, may be infected with the human *B. diphtherie*. In the case of milk and milk products, which undoubtedly sometimes convey diphtheria, the cows yielding the milk, found to be infected, have *occasionally* presented lesions from which the diphtheria bacillus has been isolated, but, even in these instances, there is little evidence to prove that the lesions were *primarily* due to a diphtheritic infection, it rather suggests that some eruptive disease was present, which was subsequently infected by the milkers.

Pseudo-diphtheria bacilli are organisms resembling the Klebs-Löffler bacillus more or less closely, which occur in anginal, and sometimes in apparently healthy throats (and in the nose), but which are non-virulent to guinea-pigs, animals that are eminently susceptible to infection with the true Klebs-Löffler bacillus. The pseudo-diphtheria bacilli of the French resemble the Klebs-Löffler bacillus in almost every character save that of virulence, and, since the latter organism presents every grade of virulence, may fairly be regarded as non-virulent Klebs-Löffler organisms: in fact some of them have, it is stated, been converted into the virulent form.

The organism, usually termed the pseudo-diphtheria bacillus in this country, is different from the foregoing. It was first described by Von Hofmann, and, for the sake of distinction, may be conveniently spoken of as the Hofmann bacillus.

The Hofmann bacillus is a shorter and plumper organism than the Klebs-Löffler bacillus, has the same parallel arrangement as, but stains more deeply and uniformly than, the latter, and involution forms are infrequent. It measures about 2μ in length, is generally arranged in pairs which in shape resemble two suppositories placed base to base. Culturally, it closely resembles the Klebs-Löffler bacillus, but produces alkali, and not acid, in milk and in glucose media, and is quite non-virulent to the guinea-pig. It is frequently met with in the course of bacteriological examinations in cases of suspected diphtheria, and is often present together with the Klebs-Löffler

or sometimes occurs alone in mild anginal conditions. Many regard this organism as having no relation with the Klebs-Löffler bacillus, and as being of no pathological importance; some hold that, while it is distinct from the *B. diphtheriæ*, it is capable of producing infective anginal conditions, others consider that it is a modified and non-virulent Klebs-Löffler bacillus. It is not unlikely that more than one organism has been included under the name of the Hofmann bacillus, and, if this is so, it would help to explain the divergent views that have been expressed as to the nature of this organism. There is some evidence, not very strong perhaps, that the Hofmann bacillus is occasionally capable of being converted into a virulent Klebs-Löffler-like bacillus, a few fatal cases have been recorded in which a careful search has failed to find any but the Hofmann bacillus, and epidemic outbreaks have occurred which have been ascribed to the Hofmann bacillus, *e.g.*, by Priestley in Lambeth. In the writer's opinion, it would be better, in the present state of our knowledge, to treat anginal cases, in which the Hofmann bacillus is found, as possibly infective, though it would probably be inexpedient to admit to a general diphtheria ward (unless a prophylactic dose of antitoxin is given), nor would antitoxin be needed in the majority. If the Hofmann bacillus, or certain strains of it, should prove to be a modified diphtheria bacillus, the writer would regard it as a very attenuated Klebs-Löffler bacillus, *i.e.*, one far removed from virulence, the diphtheria-like pseudo-bacillus of the French being a Klebs-Löffler bacillus not far removed from virulence.



ANTISTREPTOCOCCIC SERUM IN SCARLET FEVER
AND DIPHTHERIA.

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THE repeated association of Streptococci, of varying lineage, with scarlet fever has led to but few attempts to treat the disease, or even its complications, with an appropriate antiserum. Marmoreck, Josias, and Baginsky obtained results which were neither conclusive nor encouraging. Forcheimer's cases were small in number, but, as regards the effect on anginous patients, were distinctly promising. Moser's serum again, used in cases for the most part of the septic variety, tended to restore confidence in this method of treatment, for, by its use, both suppurative complications and nephritis were lessened in incidence as well as in severity, this effect being noted, however, only in cases in which the serum was administered on the first or second day.

Baginsky declines to accept Moser's conclusions, but on apparently feeble grounds:—

(1) The cases, in which he used antistreptococcic serum, were smaller in number than those of Moser—50 only as compared with 481.

(2) The serum used by him in the series of cases which he opposes to those of Moser was not the same as Moser's serum.

(3) His figures are probably inaccurate, at any rate as quoted in Welch and Schamberg's *Acute Contagious Diseases* (page 474), for here it is stated, first that 50 cases were treated, and later, that "of these 58 cases, 3 died, giving a mortality of 4.2 per cent." If there were 50 cases and three deaths, the mortality should be 6.0 per cent., and if 58 cases with three deaths, it should be 5.17 per cent.

(It is possible that this case-mortality may have been calculated on half the admissions, discharges, and deaths during the year, according to the formula of the Registrar-

General of England, in which case this part of my criticism may fall to the ground.) Moser's mortality in the 81 cases, treated on the first or second day of illness, was *nil*.

Again, Baginsky, quoted from the same source, states that compared with these figures, there were 63 cases not treated by serum, of which nine died, "a mortality of 17.3 per cent." (which probably should be 14.28 per cent.). Despite his experience, however, Baginsky leans towards the employment of serum in this disease.

Gabritczewsky's results with antistreptococcic vaccine (*Rousky Vrach*, 1906 No. 16), and Roger's single case, in which the use of the blood serum of a scarlatinal convalescent caused a rapid recovery in an extremely severe and semi-comatose patient, influence one favourably.

Strengthening these practical experiences, one has the evidence of Banks (*Journal of Pathology and Bacteriology*, October, 1907) as to the variation of the opsonic index, and its relationship to the *Streptococcus scarlatinæ*. Banks supports the view that scarlatinal nephritis is due mainly, if not entirely, to streptococcal infection of the kidney. Additional and most valuable clinical evidence is furnished by Escherich and Moser, who have had remarkable results with the liberal administration of antistreptococcic serum in scarlet fever. Their dose was 200 c.cm., and, even with this, no injurious effects were observable. The mortality in the Anna-Kinderspital at Vienna was 14.5 per cent. before the serum treatment was commenced, but fell to 8 per cent. afterwards. Moser prepared his serum by the injection of horses with a bouillon culture of streptococci direct from the child. (*Osler's System of Medicine*, Vol. II., page 372.)

I have used the antistreptococcic serum in 75 cases of scarlet fever of varying character. In a few cases (eight in number) the serum employed was that prepared by various well-known firms (Burroughs Wellcome & Co., Parke Davis & Co.), but for the large majority of patients, 67 in all, Aronson's serum was used. In the present state of knowledge, it is advisable to employ a polyvalent serum, much in the same manner as the old physicians used to multiply the drugs in their prescriptions, with the hope that one or other of the antibodies contained will be the specific one required.

I have recorded elsewhere (*British Medical Journal*) the excellent result obtained in a severe septic case of scarlet fever, complicated by a deep cervical abscess, and threatening mastoid suppuration, treated with Aronson's serum, and this undoubtedly influenced me in my choice of serum.

The general results obtained were distinctly encouraging, and, had I remained in charge of the Stockport Hospital, would certainly have led me to extend my observations. I hope, therefore, that my results will induce others to pursue the matter further.

1. *Secondary angina* was never observed in a single case treated with serum, though one must not attach much importance to this, for such occurrences are but infrequent in cases undergoing ordinary hospital treatment.

2. *Glandular enlargement* is a very constant accompaniment of scarlet fever, probably occurring in more than one quarter of the cases though frequently escaping notice. The inguinal glands in particular should be observed in this connection. Schamberg found these enlarged in every single case out of 100 observations. The cervical glands are enlarged, as a rule, in about half the cases, in my experience, of those in which glandular affection is noted.

In my own cases, out of 300, not treated by antistreptococcic serum, 68 or 22·6 per cent. presented enlargement of the inguinal, anterior, or posterior cervical, maxillary, submaxillary, or sublingual glands. In cases, treated with serum, however, only four cases of enlargement were observed, 2·66 per cent. *No one of these proceeded to suppuration.*

3. In one case, the serum appeared to aid in checking the spread of a *gangrenous angina*. The patient here was a girl of 13, who was admitted with a severe septic or anginous attack with early onset of purulent rhinitis and otitis media. There was considerable swelling of the right tonsil, but incision failed to evacuate any pus. The temperature ranged about 104°, and there was marked constitutional depression, and considerable glandular swelling on the right side of the neck. On the fourth day after admission, the tonsil, right anterior fauces, and uvula were covered with a greyish-black pultaceous membrane. The odour of the breath was intensely foetid.

The patient was given 20 c.cm. of serum within a few hours

of admission, and this was repeated daily for four days, when the condition seemed so serious that 40 c.cm. were injected. The same evening, a considerable amount of sloughing tissue came away, the temperature fell to 101° within a few hours, and the pulse followed suit. A similar amount of serum (40 c.cm.) was administered next day. During the whole time, swabbing and douching with Hydrarg. Perchlor. (1-1,500) were frequently employed, and strychnine and quinine administered hypodermically. On the morning of the fifth day the general condition was infinitely improved. Temperature had fallen to 100° , and pulse was 90, and fairly strong and regular. The exudate had entirely disappeared, and a raw beefy surface was exposed, which healed fairly rapidly, though there was a distinct notch punched out of the angle between the anterior fauces and the uvula. The cervical glandular enlargement had already proceeded to suppuration, but, after incision, it healed quickly, being drained for only one day. The ear discharge and rhinitis both disappeared within the following week, *i.e.*, before the end of the fourteenth day of disease.

4. Otitis, with discharge, according to Caiger, who analysed 4,015 cases, appears with a frequency of about 11 per cent. Its occurrence is doubtless influenced by season and age, and is to a considerable extent also determined by hospital administration, meddlesome nursing playing no small part in its incidence. In 300 cases, treated on ordinary lines, I found it to occur 60 times, *i.e.*, 20.0 per cent. of the cases. In 62 cases, which were treated on the day of admission with antistreptococcic serum, it only occurred in five, *i.e.*, 8.06 per cent.

5. Nephritis is now regarded, almost universally, as due to the special implication of the kidneys in the effects of the scarlatinal toxin. Its frequency varies very considerably from about 3 to as much as 30 per cent. In my own series of 300 cases, it occurred 18 times, *i.e.*, 6.0 per cent. The routine practice in my hospital was to examine the urine of all cases every second day throughout the illness; when albumin was discovered of course the examination was made daily. In the figures referred to above, all cases are included in which any albumin was discovered. In the serum treated cases, the total number of albuminurias was eight or 10.66 per cent., a some-

what disappointing result. In two of these patients, there was true acute nephritis with lessened urine, some hæmorrhage, and more or less pyrexia; in the remainder the condition was one of febrile albuminuria, lasting for two or three days, and sometimes re-appearing a week or two later.

6. Rheumatism I have found present in about 8·6 per cent. of the cases observed and undergoing routine treatment. In serum-treated cases, it appeared three times, or with a frequency of 4 per cent.

7. Rhinitis occurred four times, and, except in one case, was very trifling.

8. Serum rash appeared twice, and was urticarial and evanescent.

9. One death occurred due to broncho-pneumonia and superincumbent diphtheria; this death took place on the fourth day in a patient who was moribund on admission.

10. The acute stage of the disease appeared to subside a little earlier in the serum-treated cases, but exact figures are difficult to quote, as the initial history of the illness is always more or less inexact.

In my first cases, I gave only 10 c.cm. of the serum on admission to hospital, *i.e.*, on the second, third, or it would sometimes be the fourth, or fifth, day of disease. Most of the patients had the serum on the second day of the disease. Better results seemed to follow the administration of 10 c.cm. for three or four successive days, and I would advise this method. In septic cases, the dose was never less than 20 c.cm., given twice or three times, and I have given 40 c.cm. to quite young children in the presence of marked septic complications without any ill effects, save a transient urticarial rash, which seldom lasted more than 12 to 16 hours.

I exceedingly regret that a change of appointment prevented my carrying my observations further. The *rationâle* of the treatment is clearly sound, and one must probably look for improvement in it to a differentiation of the causal organism, and the evolution of a more specific antiserum.

Diphtheria.—It is remarkable that, notwithstanding the frequent association of streptococci with diphtheria bacilli in cases of diphtheria, the use of antistreptococcic serum, as

an auxiliary to antitoxin, has been so very little practised, according to published records.

Councilman, with others, has published statistics of 88 cases of diphtheria, in which cultures were made from the lungs; diphtheria bacilli were present 49 times (15 times alone), streptococci 51 times (15 times alone), staphylococcus aureus 27 times, and pneumococcus 10 times.

Northrup and Prudden, in 17 cases examined, found streptococci in all lung cultures, diphtheria bacilli *absent* from all, and staphylococci in 13.

Taking 110 cases of diphtheria followed by degenerative kidney changes, Councilman found diphtheria bacilli in 20, and streptococci in 29. It is not alleged by any of these observers that the streptococci were the cause of the complicating condition, though more than one other writer ventures on the remark that pneumonias, following on diphtheria, may be due to the insuction of pyogenic cocci into the lungs.

Their frequent occurrence suggested to me that anti-streptococcic serum might be a useful adjuvant, and I accordingly used it as such in 21 cases, 8 of which were distinctly severe. The complications were unusually few, for glandular enlargement was observed but twice, albuminuria only once, and pneumonia and paralysis not at all.

The glandular enlargement was cervical, and lasted but a few days, neither case breaking down. These figures are worth but little, of course, but I trust will lead to much more extended observations.



SCARLET FEVER AND DIPHTHERIA
FROM THE PUBLIC HEALTH POINT OF VIEW.By J. T. C. NASH, M.D., D.P.H.,
County Medical Officer of Health for Norfolk.

THE public health point of view is the general, or communistic view—not necessarily in opposition to the personal—but frequently entailing restrictions or disabilities on individuals. Still the whole community is liable to restrictions and disabilities, not only in meeting the requirements of the general public health, but in all directions; and indeed it must necessarily be so.

In regard to zymotic diseases, and more particularly in respect of scarlet fever and diphtheria, on account of these diseases—like the poor (and generally through the poor)—being always with us, the public health point of view has loomed large on the public horizon for some years past. At any rate since 1889, when the Infectious Diseases Notification Act came into force, the public health point of view has been almost the main consideration.

Since the passing of this Act, public health administration has become reorganised, and more or less systematic methods of investigation and control have been inaugurated in most areas under a sanitary authority.

The main object of public health administration is to prevent disease. All organisation should therefore have the prevention of preventable diseases, such as scarlet fever or diphtheria, as its ultimate objective. The subject and scope of this article is therefore very wide. As ordinarily administered, public health measures have been in general directed towards the improvement of the environment of communities, while special measures have been organised in connection with particular outbreaks of infectious diseases.

For the successful prevention of zymotic diseases like scarlet fever and diphtheria, not only is it necessary to have what should be *antecedent* work accomplished, such as the provision of a proper water supply, effective drainage, and the prevention of nuisances; but when a case of infectious disease

is imported, or otherwise occurs, in any given neighbourhood, it is incumbent on the medical officer of health to fully investigate the possible sources of the outbreak, and to advise as to the measures which should be taken to prevent the spread of a disease, the natural tendency of which is to become epidemic. It is here that the *medical* officer is essential.

Though this officer should be in personal touch with the sanitary administration of his district in relation to the provision of pure water supplies, efficient drainage, the detection, abatement, or prevention of nuisance, etc., the details of these requirements can be carried out, for the most part, by skilled inspectors and engineers, without any special medical qualifications.

But in dealing with actual outbreaks, a knowledge not only of general medicine, but of the various branches of special preventive medicine, is essential to enable the medical officer of health to effectually combat, and control epidemic and zymotic diseases.

He must be prepared to deal with facts and individuals in a medical sense, and it is in this direction that his energies must be exerted rather than in those channels which he can delegate to a sanitary engineer or inspector.

The idea of filth being the sole origin of epidemics is almost dead, though it tends to die hard. There are still too many people who think outbreaks of small-pox, scarlet fever, or diphtheria, or any other zymotic disease, are primarily due to insanitary conditions, or, in one word, to "filth." But the expert and experienced medical officer of health knows that (apart from a contaminated water supply in some epidemics of typhoid fever and cholera) insanitary conditions in the way of water supply, drainage, or refuse, play, as a rule, only a subsidiary, if any, part in the spread of some zymotic diseases, such as scarlet fever and measles. The one insanitary condition, which does play an important part, is the relative one of overcrowding. As a general rule, in order to detect the causes at work in connection with an outbreak of scarlet fever or diphtheria, a medical inspection of individual persons becomes necessary at some stage in the course of enquiring into the outbreak. A medical knowledge of the epidemiology, bacteriology, ætiology, symptoms, course, and sequelæ of the disease in question is necessary, and a medical officer of health

needs not only a full knowledge of these, but he should have sufficient time to follow up their ramifications in actual public-health practice. He should have at his command modern methods and facts of bacteriological research, pathological investigation, sanitary exploration, and epidemiological inquiry. He, preferably, should have undergone personal training on these various lines. He should, moreover, have imbibed the principles of logic, so as to avoid the fallacies which beset the path of an inexperienced statistician. False conclusions may be readily drawn from insufficient data, or from statistics ignorantly handled.

For the best results to be obtained, it is obvious that a well-equipped whole-time medical officer of health is a *sine qua non*, and that he should be in charge of a town or district sufficiently large to ensure his time being fully occupied, and, at the same time, sufficiently financed to raise an adequate salary for his highly skilled services.

From the public health view point, the epidemiology of scarlet fever and diphtheria is, of course, of great importance and interest. Drs. Whitelegge¹ and Hamer,² in their respective Milroy lectures, have dealt with the cyclical prevalence of infective diseases.

Again, Dr. Fremantle,³ County Medical Officer of Health for Hertfordshire, has laid stress upon the rhythmic prevalence of scarlet fever, which rises and falls, not only with the seasons in any one year, but also over a series of years. He describes a thirty-year swell, a five-year wave, and a seasonal ripple. Thus scarlet fever was specially prevalent (and malignant) in the years 1801-4, 1834, 1861-70, and 1900-2. Such rhythmic prevalence being recognised, it becomes possible to forecast the behaviour, and probable amount of scarlet fever in any given year. At any rate, in Hertfordshire, Dr. Fremantle rightly predicted an increase of notifications of scarlet fever in the years 1906 and 1907, and ventured to predict that the chances were against any increase this year (1908) in the county generally, though emphasising the need of precautions being taken in a particular part of the county, which had not yet undergone its periodic rise in the incidence of scarlet fever.

It stands to reason that every epidemic must result in a

¹ Whitelegge : "Changes of Type in Epidemic Disease," *B. M. J.*, Vol. I., 1893.

² Hamer : *Milroy Lectures*, 1906.

³ "Public Health," and *Annual Report for Hertfordshire*, for the year 1907.

large proportion of the inflammable material—in other words—the susceptible children—being rendered insusceptible or non-inflammable. But the inflammable material is gradually replenished, in the course of five years, by a new generation to such an extent as to make the five-yearly swell appreciable.

The thirty-yearly swell is less easy of explanation, though possibly it may be partly due to the fact that persons of susceptible age are entirely a new generation, as compared with thirty years previously.

It is often asked, as a reproach to the public health service, why scarlet fever and diphtheria remain so prevalent? There are many reasons. Three of prime importance are, I think, (1) The increased facilities for travelling, and the greater advantage taken of these facilities by the humblest people. (2) Compulsory education, and especially the practice, which until recently has been unchecked, of encouraging the attendance at infant schools of young children between 3 and 4 years of age. (3) The want, up to the present, of a protective vaccine against these diseases, such as has, for instance, enabled us to practically stamp out small-pox.

The bacteriology of scarlet fever is by no means settled. Klein has described a streptococcus, to which Gordon has given the names of *S. conglomeratus*, but it is far from certain that this is the micro-organism of scarlet fever. Indeed Mallory¹ and Duval² strongly advocate a protozoon parasite as the probable causal agent. Of course, prompt notification is essential to effectively bring into play the preventive powers of isolation and disinfection.

The experience of every medical officer of health, however, is that, at times, cases fail to be notified for various reasons, such as—

(1) A child does not seem ill though there is a rash. The mother thinks it cannot be scarlet fever, and does not call in a doctor. (2) Mild scarlet fever is, in certain cases, difficult of diagnosis even by a medical man.

In connection with the control of scarlet fever, reference must be made to isolation in special fever hospitals, because not only have such hospitals been condemned as useless, but

¹ *Journal of Medical Research*, 1904, Vol. V., 485-492.

² *Virchow's Archiv*, 1905, Vol. CLXXIX, 485-498.

The drawings showing these protozoa are reproduced in McCollom's article on Scarlet Fever in Osler and McCrae's *System of Medicine*, 1907.

have even been accused of actually spreading, and accentuating the virulence of, the disease. The whole question, in my opinion, turns upon the administration of the particular hospitals. I strongly hold the view that, properly administered, fever hospitals have proved of very great assistance in checking outbreaks of scarlet fever, perhaps chiefly through limiting the number of secondary cases occurring in individual families.

For a fever hospital to prove effective as a factor in public health administration, it should, in the first place, be in the closest possible touch with the public health department, so that speedy arrangements can be made for the removal to hospital of early notified cases. Delay in notification, or in making immediate arrangements for the removal of an early notified case to hospital, to a large extent defeats the object of a fever hospital.

The main object of an isolation hospital, I take it, is to limit the spread of an infectious disease generally, by limiting its spread in an individual family. Its object is preventive, clearly to prevent, if possible, other persons, and more particularly those in the same family, from acquiring the disease.

Where several members of a family are already stricken, the object and real use of an isolation hospital have already been in large measure defeated, through ignorance and carelessness on the part of somebody. In such a case, I am of opinion that where the majority of the members of a family, in a town in which some cases of scarlet fever are occurring, are already attacked before hospital isolation is attempted, the proper policy is to treat those patients at home, converting the house into a domestic isolation hospital. If sufficient care and supervision are exercised, persons in neighbouring homes run practically very little risk. Of course the main objection to home isolation is the difficulty of securing that no member of another family, or member of the same family living in another house, enters the infected house; but printed slips of precautions and warning, left at the infected house, drawing particular attention to danger and penalties, go a long way towards minimising these possibilities. My chief objection to admitting several members of one family to a hospital is founded on the fact that several beds are occupied, which should be kept in reserve, since they may be required to effectively deal with outbreaks occurring in other houses. A

fever hospital is not a charitable institution for a family, but a necessary part of public health administration to prevent the spread of an infectious disease. If the beds, provided for the protection of the whole population of a town or district, are taken up by several members of a few families, insufficient provision remains for the preponderating bulk of families, which are entitled to be safeguarded, provided early notification is received. A very important point in the administration of the hospital, if it is going to prove a really preventive measure instead of a possible danger, is *the strict limitation of the numbers admitted*. The Local Government Board wisely insist on a cubic space provision of 2,000 cubic feet for each patient in a fever hospital. Only, in exceptional circumstances, should this limit be reduced, and I have resolutely declined to reduce the cubic air space per patient below 1,600 cubic feet, and then only when I saw a prospect of early discharge of some convalescents, which would secure the *status quo* within a day or two. Should the cubic space for each patient be further reduced, complications are sure to arise. In a common ward, each patient is, to a certain extent, a source of possible detriment to the others. Thus, if a child suffering from scarlet fever is admitted with a profuse nasal discharge, there is risk of the germs, accounting for that discharge, being transferred to other patients in the ward, unless at least 2,000 cubic feet per patient is insisted upon. Other points of internal administration are also of importance in determining whether a fever hospital is of real use or the reverse; particularly in regard to the supervision and instruction of the nurses with reference to their duties.

A point to be constantly urged, until the nurses almost automatically act on the idea, is that *each patient should be looked upon as possibly harbouring some form of infection which might be transferred to another*. This idea involves not only separate articles of linen, food, crockery, and plate, but also, what is more important still, that the nurse should carefully soak her hands in a suitable disinfectant solution, after attending to *each patient before proceeding with the next*, even in a ward labelled for one recognised zymotic disease, say scarlet fever. When properly administered, a fever hospital can only work for good, but, under bad management, or insufficient control, it might easily be a source of evil. There is much to be said for glass partitions between beds, but I am satisfied that the

main point is to have each patient dealt with, as if he or she might infect or receive infection from another.

As to the question of releasing a patient from hospital isolation, there is now a large mass of evidence that the later stages of peeling are not, as a general rule, infective. The probabilities are that, during the earlier stages, the skin scales do really contain infective material. After the skin has once peeled, however, roughnesses or "pin points" are probably harmless.

At these later stages, the condition of the mucous membranes is more important, and conditions of the nose, ear, and mouth require close attention. There can be no doubt, from abundant evidence, that an eczematous condition at angle of mouth, or margin of nostril, or junction of ear with head, is strongly infective. Aural and intra-nasal lesions are also highly infective. So too are enlarged tonsils, or adenoid growths. Ulcers within the nose are generally found on the septum nasi; some are readily detected, others require very careful looking for. The persistence of a slight nasal discharge, perhaps limited to a bead of watery discharge in the morning, is an indication that an unhealed and infective lesion still persists. Such a patient is liable to infect others, even though weeks may have elapsed since desquamation was complete. On the one hand, a patient can be released from isolation in less than six weeks, if he has "peeled" once, and is quite free from lesions of the mucous membranes or marginal eczemas; while, on the other hand, a patient who may have completely desquamated, in six weeks time may require to be quarantined for some weeks longer, owing to a persistent nasal discharge. My own experience, as a medical officer of health, is that "return" cases are, if anything, more frequent among home treated cases than among hospital treated cases, the reason apparently being that slight nasal complications are frequently overlooked and the patient released from isolation at the end of peeling or an arbitrary period of six weeks.

In my Annual Report, for the year 1907, on the Health of the Borough for Southend-on-Sea, I wrote, after careful inquiry, "During the year 1907, I considered that six cases were probable 'return' cases after hospital isolation, while two 'return' cases occurred after 'home' isolation." The number of cases treated in hospital was 122 as against 46 treated at home; the percentage of return cases being approximately the same. In 1906, the home 'return' cases were in larger

proportion than the hospital cases.

Recrudescence of a disease is an important fact from a public health view point.

Dr. Newsholme,¹ Medical Officer to the Local Government Board, has drawn special attention to this factor. In the report, to which I have already alluded, I record three interesting cases, which recrudesced, at an interval of a few months, after a very definite previous attack of scarlet fever. In these cases, the infective germ of scarlet fever lies dormant within the nasal or pharyngeal mucous membrane, until some exciting cause, such as a chill, causes a recrudescence of virulence. A particularly susceptible individual, then, may fall again with all the symptoms of the disease repeated. These cases are analogous to cases, which occasionally occur among persons, who have been attacked with diphtheria. The important point is the recrudescence in virulence of the germ. Interesting as the definite second attack may be within a few months of an equally definite primary attack, the repetitions of the symptoms is fortunate from the public health point of view, because recognition of the disease again secures notification and isolation of the patient.

More serious from the public health point of view are those cases, which undoubtedly occur, where there is a recrudescence of virulence of the infective organism, without any symptoms in the carrier.

I have traced an outbreak of scarlet fever to a visitor, who had had an attack 12 months previously, and who, a few days after his arrival, developed a cold with a nasal discharge: although himself without symptoms, he infected two members of the family where he was lodging.

I could quote other instances in support of this. A person may be a carrier in a double sense: (*a*) he may be a carrier of a virulent germ; (*b*) he may be the carrier of a non-virulent germ, which may acquire virulence when his own health sinks below par.

Mild cases and "recrudescent" cases and "carriers" of virulent, or potentially virulent germs, account largely for the fact that infective diseases, like scarlet fever and diphtheria,

¹ "Protracted and Recrudescent Infection in Diphtheria and Scarlet Fever," by Arthur Newsholme, M.D., F.R.C.P. A paper read before the Royal Med. and Surg. Soc., June 14, 1904.

persist after the most exhaustive pains have been taken as regards isolation and disinfection. A carrier may have no symptoms at all; a mild case may be so wanting in the cardinal symptoms as to be difficult of recognition. This latter consideration applies more to scarlet fever than to diphtheria, because bacteriological aid can be invoked in relation to the latter disease.

These mild or unrecognisable cases afford much support to the theory of evolution, as applied to diseases, and as opposed to the doctrine of unalterable specificity.¹

Fomites, as a source of infection, are generally provided for in some form by means of disinfection. Through carelessness some infective materials may escape careful measures of disinfection, as illustrated by the following case:—

A young lady found and handled some filthy rags stuffed under the sill of a window which overlooked a conservatory. Two days later she fell ill with scarlet fever. A few months previously a former tenant had suffered from scarlet fever. The rags had probably been placed out of sight by a culpable and lazy attendant.

I shall pass on to say a few words about diphtheria. In this disease, the ordinary site of implantation (therefore of infective importance) is the tonsil, or pharynx generally; but, in numerous cases, the nose is also affected, and naso-pharyngeal diphtheria is really more common than is generally allowed for by many a practitioner. Occasionally, the nose is alone affected, and, in such cases, unless the practitioner is alive to the fact, and makes a systematic inspection of the nose, as well as of the throat, not only is a serious disease often overlooked to the disadvantage of the patient; but what, from a public health point of view, is of much greater importance, an active focus of infection is unrecognised, and sometimes gives rise to numerous cases of diphtheria, which seem difficult to account for.

Another point of great interest and importance, from a public health point of view, in connection with nasal diphtheria, is that this form of the disease sometimes becomes chronic and gives rise to a chronic form of rhinitis, and even the expert rhinologist may not (as has happened within my experience) be infallible, or proof against making a serious

¹ See "Evolution in Relation to Disease," by J. T. C. Nash, M.D., *Trans. Epidem. Soc.*, N.S., Vol. XXV., 204-244, which contains references to many other papers on this subject.

mistake in regard to the ætiology of this affection.

An interesting illustration came under my own observation a few years ago. A practitioner, in the course of conversation with me, mentioned that a lady, a schoolmistress, had recently come into the district, and had consulted him about a chronic nasal affection. I do not recollect what specially induced me to advise him to take a swab from this lady's nose, and submit it to me for bacteriological examination, but, at any rate, he acted on my suggestion, and I found that typical Klebs-Löffler diphtheria bacilli were present in the nose. The lady came into hospital, and so I had an opportunity of enquiring into the antecedents. I ascertained that she was a mistress in an infants' school in ---shire; that diphtheria had broken out, again and again, in the class she taught; that the school authority and the sanitary authority had been sorely worried and perplexed in consequence, because school closure, and careful disinfection, in addition to examination of scholars on re-admittance, had so repeatedly failed. But no one had ever thought of examining the schoolmistress. She had been suffering from the rhinitis for some two or three years, and had, at intervals, consulted a London specialist, but without ever being cured. After treatment, however, with diphtheria antitoxin, and careful antiseptic treatment of the nose, she speedily recovered. Her rhinitis of so long standing was cured, and the diphtheria bacillus was eradicated. At any rate, three consecutive swabbings of the nose failed to discover the organism prior to her discharge from hospital.

Another site or implantation of the diphtheria bacillus, which is of rarer occurrence (but probably less rare than is imagined), is again one for this very reason of high public health import. I mean diphtheria of the skin. I remember a medical student who came into hospital, into the diphtheria block, on a positive swab taken from his throat. I noticed a scab on his finger, and ascertained that its origin was *antecedent* to his sore throat. He was a clinical clerk to the out-patient department of a large metropolitan hospital, and he attributed the sore on his finger to septic infection in the course of his duties. No bacteriological examination had hitherto been made; but, suspecting the finger to be the primary seat of infection, I took a culture from it, and found the true diphtheria bacillus under the scab.

Since then I have noticed in the Medical Journals more than one reference to diphtheria bacilli being found in chronic skin diseases, and not the least among these are the chronic impetigos; ichthymatous, eczematous, or bullous eruptions so often found among school children.

The systematic medical inspection of school children now compulsory will probably reveal additional facts bearing on this point. Only at the last meeting of the British Medical Association at Sheffield, Dr. Eddowes (*Lancet*, Sept. 5, 1908, page 732) described some cases, which had led him to conclude that the Klebs-Löffler bacillus played a more important part in the production of skin diseases than had been hitherto expected. In one case there had existed an almost generalised weeping, red, and crusted eczema, chronic conjunctivitis, and photophobia. After three years' ordinary treatment, this patient had only obtained partial and temporary relief; but, as soon as the bacteriological examination had revealed the presence of the Klebs-Löffler bacillus, antitoxin treatment was commenced, and was immediately followed by a most striking and rapid recovery, after five injections, each of 4,000 units.

Dr. Eddowes and Dr. Hare are of opinion that there is something diagnostic about even the clinical appearances of diphtheritic eczema, and I am inclined to agree with them, for, in the few cases in which I have found diphtheria bacilli in skin affections, I have suspected its presence from the clinical appearances. There is also a peculiar appearance about a throat, the seat of implantation of Klebs-Löffler bacilli even (as sometimes occurs) when there is no discernible membrane. In making clinical examination of the throats of diphtheria contacts, I have often been led to take swabs from such throats, which perhaps might have been easily passed by some observers as normal. The appearance is not easy to describe; there is no obvious membrane or swelling, but the pillars of the fauces are rather dry and glazed, and of a darkish purplish hue.

That scarlet fever (except when due to an infected milk supply) tends to spread more from one member of a family to another than to become really epidemic, may be illustrated again and again. Thus in a certain rural district, 47 cases occurred in 24 families in the course of a twelvemonth. It is legitimate to infer that a very considerable proportion of these cases were secondary to a first case, and would have been

prevented had prompt hospital isolation been available. It is interesting to note that, even in the absence of an isolation hospital, there was no real epidemic prevalence.

In another rural district, the Medical Officer of Health reported that there were eight cases distributed through six parishes, and each one of the eight seemed to be entirely independent of the others.

The wave prevalence, referred to on a former page, is illustrated by a report from another rural district, in which the disease had been prevalent during the entire twelve months of the previous year. The invasion continued for the first four months of 1907, and then suddenly disappeared, no further case occurring between May and December.

Many Medical Officers refer to the toll paid by "missed" cases in spreading infection. The failure to recognise a mild case of scarlet fever is sometimes a fault on the part of the parent, and sometimes arises through carelessness, or real inability to decide, on the part of the medical attendant. Too often a casual or indifferent diagnosis is based on the presence or absence of a rash. Diagnosis, based on a rash alone, must frequently prove erroneous, particularly if only a part of the body is looked at. It is of great importance, when dealing with any complaint, which may possibly prove to be of an infective nature that the problem of diagnosis should be seriously approached, all available evidence in the way of symptoms (and history) duly weighed before coming to a decision.

This is particularly necessary in mild cases of scarlet fever, or of diphtheria. No doubt greater attention is being now given to this factor of "missed" cases, and, in future, probably fewer cases will escape notification. Much could be done without the help of an isolation hospital were mild cases systematically sought out, and indeed such action is necessary, even in districts where hospital isolation is provided. Unless looked for, these mild cases escape attention, and continue to spread infection in spite of all other measures.

Attendance at school is probably one of the chief factors at work at the present time in the incidence both of scarlet fever and diphtheria. I am convinced that, but for school influences, there would be a very marked and immediate diminution in the number of cases of infectious diseases, and that public health administration, as hitherto carried out, would ere this

have secured even better results than it is able to show. It is to be hoped that the systematic medical inspection of school children, now provided for by the legislature, will not only result in the early detection of those actually infected, and those most likely to be infected (such as children with adenoids, enlarged tonsils, etc.) but will secure ample cubic air-space for each child, and the maintenance of efficient ventilation in school. The systematic medical inspection of school children cannot fail to reduce the incidence of scarlet fever and diphtheria through school influences.

Very interesting and instructive are the outbreaks of scarlet fever, or diphtheria, which occasionally occur, and which are traced to infection being carried by milk.

Though generally traceable to a human source, instances are on record which render it highly probable that infection may come direct from the cow. The Public Health Officer, in such cases, naturally invokes the aid of the veterinary surgeon, and of the laboratory for research. The diphtheria bacillus has undoubtedly been found in infected milks, and even in lesions on the udders of a cow. The organism of scarlet fever not being definitely accepted as known, its detection in connection with any particular milk outbreak cannot be taken to have been definitely proved. In the classical "Hendon Outbreak," the cows, from which the suspected milk was obtained, had ulcers or vesicles about their udders, and certain other local symptoms, such as scaly and thickened skin about the tail and back, and from these lesions, Klein isolated the organism he has named the *Streptococcus scarlatinæ*. But, as already indicated, this organism has not been generally accepted as the undoubted causal agent of scarlet fever. Mervyn Gordon's¹ differential sugar tests for streptococci have been utilised by Andrews and Horder² in investigating 33 specimens of streptococci from scarlet-fever cases, and more recently by H. Kerr³ in 100 specimens from scarlet-fever cases; 58 specimens from healthy throats, and 50 specimens from diseased throats—not scarlet fever. The result of this very detailed and laborious research is that Gordon's tests fail to point to any particular strain of streptococcus as being even more frequently present in scarlet fever than in other conditions of the throat.

¹ Report of M. O. to the Local Government Board, 1903-4.

² *The Lancet*, 1906, Vol. II.

The Lancet, 1908, Vol. I., p. 995.

NOTES FROM FOREIGN JOURNALS

THE STATISTICS OF THE TREATMENT OF SCARLATINA BY SERUM.

Pulawski gives an account of his experiences in the use of serum, obtained from Professor Bujwid's laboratory in Cracow. Cases treated by this serum showed a mortality of 28 per cent., as opposed to a mortality of 71 per cent. in those treated by ordinary methods. (These figures are startling. They suggest either that the type of disease must have been peculiarly malignant, or that only this particular class of the disease is referred to.) The serum is quite harmless, has an immediately favourable effect, even in moribund cases, and appears able to prevent concomitant diseases and sequelæ, such as otitis, lymphadenitis, nephritis, etc.—(*Deutsch. Wochenschr.*)

OBSERVATIONS ON THE TREATMENT OF SCARLATINA WITH MOSER'S SERUM.

Moltschanoff reports the results obtained in 40 cases of scarlatina, treated with this serum, in the children's ward of the Moscow University Clinic. He is sceptical as to the effectiveness of the serum. A fall in the temperature, often combined with an improvement in the general condition, has been observed in the majority of the cases, but he does not believe that the serum produces anything like a deep influence upon the whole of the scarlatinal process. The pyrexial stage and the length of the disease are no shorter in those cases treated with the serum than in those not so treated.—(*Jahrb. f. Kinderheilkund.*)

THE USE OF PYOCYANASE IN DIPHTHERIA.

Mühsam states that, *in vitro*, pyocyanase inhibits the growth of *B. diphtheriæ*, and, in comparatively small doses, kills large quantities of these bacilli. In actual treatment of the disease with this substance, the throat of the patient is sprayed three times a day, at first more frequently, with 2 c.c. of pyocyanase warmed to 40° C. It appears to bring about the disappearance of the membrane, and favourably to promote the general condition of the patient. The fœtor from the mouth is quickly stopped. Pyocyanase should only be used in conjunction with the anti-toxin treatment. The clinical experiences already obtained demand further investigations in the matter.—(*Deutsch. med. Wochenschr.*)

THE USE OF PYOCYANASE IN DIPHTHERIA, AND THE PERSISTENCE OF THE BACILLUS DIPHTHERIÆ.

Schlippe observes that pyocyanase should not be used alone in diphtheria but always in addition to the anti-toxin treatment. In many cases, it appears to promote the solution of the diphtheritic membrane, to abolish very quickly the fœtor from the mouth, and to produce subjective improvement. It therefore deserves to be tested further in cases with extensive formation of membrane, and of delayed separation of membrane. In very severe cases of septic diphtheria, it appears to be of no effect. It does not inhibit the persistence of the bacillus diphtheriæ, nor does it destroy the bacilli in cases of extra-persistence, and of chronic diphtheria.—(*Deutsch. med. Wochenschr.*)

DIPHTHERIA IN THE HÔPITAL DES ENFANTS-MALADES.

Baudoin and Brissaud presented the statistics of the diphtheria-block, for 1907, at a meeting of the Société Médicale des Hôpitaux. During the year, 789 patients were admitted, of whom 555 were suffering from diphtheria, and the remainder from other diseases. Of the 555 cases of diphtheria, 58 died, giving a percentage of 10.45. If from the total are subtracted the cases which died within 24 hours after admission, and upon whom treatment had had no time to act, the mortality is reduced to 6.4 per cent. Serum-eruptions in diphtheritic and non-diphtheritic cases (all received injections) occurred in about 13 per cent. of the cases.—(*Le Progrès Médical*.)

ON THE QUESTION OF THE OPERATIVE TREATMENT OF DIPHTHERITIC STENOSIS OF THE LARYNX IN YOUNG CHILDREN.

According to Moltschanoff, no further doubt exists as to the advantage of intubation over tracheotomy in the operative treatment of diphtheritic obstruction of the larynx in older children. As regards infants, opinions are still divided. On the strength of his observations on the wealth of material in the Moscow Children's Hospital, he has come to the conclusion that, in infants, the unfavourable conditions act in exactly the same way in intubation as in tracheotomy. They are only conditional by reason of the earlier age, and not because of the operation as such. He therefore gives the preference to intubation even in infants. He quotes, simply on account of the infrequency of the case, the history of an infant, only 8 weeks old, who was admitted suffering from severe diphtheria affecting the nose, the pharynx, and the larynx. Timely use of the serum, and of intubation, brought about a recovery.—(*Jahrb. f. Kinderheilkund.*)

FIFTEEN YEARS' EXPERIENCE WITH, AND OBSERVATIONS ON, INTUBATION.

Paul Reich reports upon intubation in 1,312 cases of diphtheritic stenosis, in children of various ages, treated in the Royal University Children's Clinic at Munich. 48.6 per cent. were cured, but, if the total is confined only to the period of serum-treatment, the percentage sinks to 36. The difference of sex is small. The influence of age is great. In children, under two years of age, the mortality was 67.6 per cent., above that age 45.6 per cent. Of 69 children, in their first year, only 8 were saved. The original paper contains extraordinarily exact and minute details concerning all the difficulties and the complications to be met with in the treatment of diphtheria by intubation. In effect, the experiences go to prove that the most successful method of treatment of diphtheritic stenosis of the larynx is by intubation and anti-toxin injections.—(*Jahrb. f. Kinderheilkund.*)

THE RECOVERY OF THE DIPHTHERIA TOXIN FROM ITS COMBINATION WITH THE ANTI-TOXIN.

Experimental researches by Morgenroth and Willanen show that, as is the case with cobra-poison and its anti-toxin, the combination of the diphtheritic toxin with its anti-toxin will not take place in the presence of a weakly acid reaction. Any combination of the two, already effected, is reduced again in a short time by acidulation.—(*Virchow's Archiv.*)

Notes by the Way.

Scarlet Fever
and Diphtheria.

OUR current number forms a complete account of almost every aspect of two of the most important diseases to which mankind—and especially children—are susceptible in this country. The reason for their importance is different in the two cases. Scarlatina has a comparatively low mortality, and is in most cases a mild disease ; yet it is widespread, and exacts a heavy toll on the rising generation. Diphtheria, on the other hand, is—or was, previously to the discovery of anti-toxin—a malady of most formidable character ; and, though less prevalent than scarlet fever, was a greater enemy to the race owing to its high mortality and the terrible distress which it caused. The two diseases have much in common, and it is appropriate that they should be considered side by side. There is, however, one important difference between the two. Diphtheria has yielded the secret of its causation to modern research, and its pathology is so well understood that little remains to be discovered : the pathogenic nature of the bacillus, its connection with the disease, the rôle of the toxin in the production of the symptoms and sequelæ, the methods by which the infection and the toxin are combated, are hardly matters for discussion at the present day. But in the case of scarlet fever all is in confusion. It is true that a strong case has been made out in favour of a streptococcus of peculiar characters, so clearly described by Dr. Mervyn Gordon, but still serious difficulties remain, and probably the majority of bacteriologists regard this organism as a secondary infection ; important, it is true, in producing some of the complications and in determining the severity of the attack, but not the actual prime cause of the disease.

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Modern
Investigation.

DISEASE is to be regarded from two aspects: that of the individual and that of the race. In each of these we see the enormous advantage of successful scientific work when we compare the two

diseases. In diphtheria modern research has given us a valuable, and in skilled hands practically conclusive, method of diagnosis. It has done more than merely providing a method by which the true diphtheric sore throat can be differentiated from the varieties due to other causes for it has shown us the existence of cases of disease of the nose, skin, and other regions, due to the same infective agent, and amenable to the same method of treatment. In scarlet fever this is not the case. The streptococcus scarlatinæ cannot be demonstrated in every case, and until the question is more fully ventilated, cannot be regarded as affording proof of the nature of the disease. Further, as regards treatment. We must not be taken to deny the beneficial action of the sera discussed by Dr. Gordon and others in the treatment of scarlatina, for which there seems to be sufficient evidence; and though they are required in comparatively few cases, that does not detract from their value. Yet the benefit to be derived from them is as nothing compared with that which has resulted from the use of diphtheria anti-toxin.

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Next, as regards the public health, or as
Public Health. Dr. Nash calls it, the communistic point of view. Here the advantage to be derived from definite scientific knowledge is most marked, though unfortunately practical considerations often prevent us from reaping the full benefit of our discoveries. In the case of diphtheria we are now in a position to say that personal infection is the great factor to be considered, but that the infecting person need not have, or have had any attack of what was recognised as diphtheria by the clinicians: an affection due to the diphtheria bacillus, whether a mild and lightly esteemed nasal catarrh, a skin rash, or an attack of vaginitis, may be sufficient: or the carrier may appear perfectly healthy. Again, the influence of milk, water, and various domestic animals has been thoroughly investigated, and it is seen that the paths by which the infection can be carried are fully known. But in the case of scarlet fever comparatively little advance has been made. We are certain of the great importance of direct infection, but no bacteriologist can at present determine whether a given person is infective nor have we any knowledge whether scarlet

ever may masquerade as another disease, and so give rise to an epidemic which appears to arise *ab initio*.

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**Difficulties
in the Way of
Prevention.**

It has often been said, and justly, if preventable, why not prevented? And in no disease is the question more reasonable than in diphtheria. The sceptic would appear at first sight to have abundant cause to doubt the value of medical research from the communistic point of view, when he finds that, even in the case of a disease understood as well as is diphtheria, the number of cases shows no tendency to decline, though the mortality has so greatly diminished. The lions that stand in the path are inconvenience, cost, prejudice, and ignorance and, but for these, there is little doubt that the disease might become as extinct as the dodo. Every medical man must have been placed in positions in which his duty to his patient and his duty to the public are diametrically opposed. Take the case, for instance, of a boy, whose future professional career depends on his passing an examination by a certain age, and who persistently harbours diphtheria bacilli in his throat in spite of most careful treatment: or what was to be done with the schoolmistress mentioned by Dr. Nash, supposing that she were entirely dependent on teaching for her livelihood, and the bacilli did not disappear for many months? Such cases are of frequent occurrence, and constitute problems of great practical difficulty. But of all the causes, which impede the efforts of the medical man in stamping out disease, ignorance is the greatest. The practical man (usually the most hopelessly impractical of all beings) scoffs at bacteriology, and declines to believe in more than he can see. Efforts in sanitation are thought to be weird and strange, and, what is worse, the well-investigated and proven results of the scientific investigation of disease, results as fully proven as the theory of gravitation or of the circulation of the blood, are confused with the brainless vapouring of cranks. Our greatest hope in the future lies in the education of the people, and when the reasons for a course of action are fully understood, hearty co-operation can usually be obtained even from those who suffer from it.

THE PRACTITIONER.

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THE RELATION OF SOME CONSTITUTIONAL CONDITIONS TO LOCAL LESIONS, TRAUMATIC AND OTHERWISE.¹

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THE proverbial misfortunes of the dog with a bad name is familiar to us all. We know how difficult it is, when once he has gotten the bad name, no matter how good his subsequent behaviour may be, to get rid of the stigma which attaches to him. He may become an excellent animal in all respects; he may do everything that is right, but should any lapse from rectitude occur, his bad name comes back upon him, poor beast, and, if he is not exactly hanged, he at all events receives very little consideration for his previous good works. As with the dog, so it is with men, especially when the reputation of the constitution of an individual in relation to attacks of disease, or to eccentricity in behaviour after injury, is concerned. In other words, given an individual with a constitutional defect, whether it be already known, or whether it be ascertained by bacteriological, or other examinations, any disease, or departure from the normal course in the recovery from an injury, is far too frequently attributed to the fault of his constitution. In many instances, the history of a man's case, or the existence of some aberration of constitution, is allowed to outweigh the local evidence presented by the disease itself, which, in my opinion—and I am sure it must also be so in the opinion of most people—is a very unfortunate state of affairs. It is mainly the outcome of the tendency in the teaching at the present time, especially in connection with the supreme importance which is attached to all bacteriological investigations. I do not, for a moment, mean to say that bacteriological and other investigations of a similar kind are not urgently necessary, nor that they are

¹ An address delivered before the Wimbledon Medical Society.

not generally of great value ; but it cannot be denied that there is, in many instances, a growing inclination to rely too much upon them, to the exclusion of a proper weighing of local manifestations in arriving at a diagnosis. Again it happens, even now, that quite a number of people, in setting about the investigation of a case, commence with the patient's history. Then, having arrived at a knowledge of all the evils which have affected him and his family, so far as is possible, for generations before, the local condition is investigated, with the bias which, by these enquiries, has been created. In commencing a diagnosis in this way, it is obvious that the start is made at a considerable disadvantage.

As a very gross example of what I have in my mind, let me relate an instance, which is a very extraordinary one, and which, unless it had really happened in my experience, I should hardly have believed possible. Some years ago, early in my career, I was asked to give an anæsthetic for a surgeon of repute at that time, in order that he might lay open a suppurating node on a man's forehead. Suppurating nodes were commoner in those days than they are now, and, seeing that the operation was a slight one, nitrous oxide gas was given in the ordinary way, and the "node" laid open. The contents, however, proved to be different from those which usually escape from a suppurating node, and, as a matter of fact, the lesion was a suppurating sebaceous cyst. It is hardly conceivable that a man, with the reputation and experience of this surgeon, could have been guilty of what was in truth an unpardonable mistake. But the patient was the subject of syphilis which he had acquired a year or so before, he had gone through the various phases of the disease, and there were about him, at the time of this occurrence, other evidences of syphilis. It was the mere existence of this constitutional dyscrasia which led the surgeon, experienced as he was, to conclude, without further enquiries, that a rapidly increasing swelling on the forehead, the situation in which, of course, sebaceous cysts and nodes are common, was, simply, because the man happened to be the subject of syphilis, a suppurating node. Indeed, he candidly admitted afterwards, that he had hardly examined the swelling itself, having taken it as a matter of course that the lesion was what he had thought it to be in con-

sequence of the constitutional defect in the patient. This very crudely illustrates what I mean, when I say that there is danger, unless cases are approached from the right point of view, of being misled by constitutional conditions which have nothing to do with the case. The first point then that I wish to insist upon is this, that, in ordinary diagnosis, the object of primary importance is the local condition, not the constitutional state.

Take for another example, a case like this :—A man who, at the time of the performance of the operation, was, to the best of my recollection, 38 years of age, had his right testicle removed for malignant disease. There appears to have been no doubt about the disease having been malignant. Clinically, it was stated to have appeared to be so, and microscopically the diagnosis was confirmed. Four years afterwards, this same man had a tumour of the other testicle—not at all an uncommon sequence in a case of malignant growth—which was looked upon as an appearance, in the remaining testicle, of the same disease which had caused him the loss of the first, and it was about to be dealt with in the same way, the assumption of its malignancy being based upon the fact that the testicle, which had been removed, was malignant, a reasonable conclusion in ordinary circumstances. But, for some reason or another, I suppose the local peculiarities of the swelling in the second testicle had not been very carefully investigated, it having been condemned, without much hesitation, rather because the other had been removed for malignant disease, than because there was anything about the local condition itself conclusively pointing to its being the result of carcinoma or sarcoma. When, therefore, the case came under observation, and it had been examined from the other aspect, that is, from the point of view of the evidence afforded by the local condition, without regard to the constitutional state of the patient, and without regard to what had gone before, the testicle seemed obviously to be affected by syphilitic gummata. Whether the disease in the first testicle was malignant or not might, in the circumstances, become a question. It appeared clear that it was so, but this was no reason for concluding, without very careful investigation of the local manifestation, that the disease in the second was of the same nature. This leads me to the next point upon which I wish to insist, viz. :—

that it does not by any means follow, because a patient is the subject of a constitutional defect which leads to the development of some form of disease, let us say a syphilitic or malignant growth, that if he has two or more developments of disease, either in the same part of the body or in different parts, that they should be of the same nature.

To emphasise this fact still further, the following case will serve. As it occurred under my immediate notice, I know the case from beginning to end. A sailor, whilst ragging on board ship, fell down and hurt his shoulder. Some six or seven months afterwards, some swelling occurred, and he then thought it time to seek advice. It was obvious that he had a malignant tumour at the upper end of his humerus, a diagnosis which was corroborated by the X-rays, and the arm was amputated at the shoulder joint. Section of the specimen showed a beautifully defined endosteal sarcoma of the ordinary type. Recovery followed in the usual way. Some years afterwards, he presented himself with a swelling over the upper end of the tibia. Now, in view of the possible sequence of events in a case of that kind, it was of course impossible to ignore the primary suggestion that this was another manifestation like the original disease, and, unless the case had been approached in a sceptical mood, which led to particular care in approaching evidences of disease from the local side rather than the constitutional aspect, it would have been very easy to suppose that the tibial disease was of the same nature as that which involved the shoulder. There was abrupt thickening of the inner side of the tibia with hardly any tenderness, and the general aspect, at first sight, was quite compatible with malignant disease, with this exception :—that the enlargement of the head of the bone was confined entirely to one side. Considering the size of the tumour, which was about 4 inches in length, it would be a most exceptional thing in the upper end of a bone like the tibia, where there is so much cancellous tissue, to find endosteal sarcoma growing entirely in one direction. Endosteal sarcoma, occurring in the cancellous end of the bone, generally grows up to a certain point equally in all directions, and later, as it progresses, it may possibly extend more in one direction than in another, so that it projects irregularly, but in this instance, the tumour involved merely the inner side of the bone. The original tumour was an endosteal sarcoma, the clinical charac-

teristics of which would not fit in with the signs which I have mentioned, and I, consequently, did not condemn the patient, as I was rather expected to do, to amputation of the thigh. My impression was that he was suffering from tuberculous osteitis. And, having that in my mind, an X-ray photograph was of course taken, which should be done in any case, and it showed, as I expected, that the swelling was due to thickening of a non-malignant kind, involving the upper third of the tibia. I do not mention the case for the purpose of giving the impression that there was any cleverness in the diagnosis, which was not the case, but to emphasise the fact that, if I had not had firmly in mind the great importance of the local aspect, and not the constitutional, I might easily have been misled. Certainly, a man living in an out-of-the-way part of the world, where he had not the advantage of the help of the X-rays, unless he was possessed of a suspicious mind, might easily have been led to sacrifice that man's limb. It is true that an exploratory incision might have been made, but even then the appearance might have been deceptive, because the early stages of tuberculous manifestation in bone are extraordinarily like the small mixed cell sarcomaed.

I now come to another point. I have said that there is a growing inclination to rely upon the evidence of laboratory investigations in diagnosis, and no doubt that tendency is increasing. Looking back, I have no doubt that the clinician of 25 or 30 years ago was from necessity more skilful than the clinician of to-day: I mean the power of bedside diagnosis was greater 25 years ago than it is to-day. Of that I am certain, from what I note in the course of ordinary consultation work. This is the outcome of the tendency of us all to rely too exclusively on laboratory work in diagnosis. It is a common experience, in a consultation in these days, to find an expression of opinion given up to a certain point as to the diagnosis, the final decision being postponed until a blood test or bacteriological examinations have been made. Now, this reliance upon the laboratory as a last resource checks, as does the exploratory operation, the impetus to real clinical work, at least so it seems to me, and many a case has been wrongly diagnosed, and therefore treated wrongly, because the diagnosis has practically depended upon the verdict of the laboratory. Do not misunderstand me in this: I do not wish it to be thought that I

deprecate laboratory work in any way, because I think that it is one of the most valuable assets of modern times ; but, if full value is to be obtained from laboratory references, there must be a consultation between the bacteriologist or pathological expert, as the case may be, on the one hand, and the people in touch with the case on the other ; moreover, if the evidence of the laboratory is not considered very closely in conjunction with the clinical factors of the case, we are as likely to be misled as to be helped in our diagnosis.

It is very easy to give examples to illustrate this point. I remember, for instance, a case in which not only was a man's health concerned, but his career in life endangered by reliance upon the pathological laboratory as a means of settling the diagnosis. The patient was a man 30 years of age. He had been in foreign parts for a considerable period, and came home on leave suffering from a disease of both knees. He also had an affection of a wrist and of one of his elbows. He was seen by several practitioners, and various investigations were made. At first he came into medical hands, because of his general condition and other things. Very little progress had been made with his case, and, finally, a bacteriological examination of his urine was made, and it was found to contain gonococci. Here was an apparently clear case, a man with multiple arthritis, the urine containing gonococci. He was a straightforward man, and had no recollection of specific disease for some years. On the strength of gonococci being found in the urine, the case was considered to be one of gonococcal arthritis. It was treated accordingly, but without success, and a report was on the point of being sent to the effect that he was the subject of this condition, which would have marred his career. He happened, however, at the instigation of a wise physician, to be brought into contact with a surgeon, because the condition of one of his knees had become rather threatening, whilst, coincidentally, the lesions of elbow and wrist began to disappear, until he was left with the disease for the most part concentrated in one knee. When the knee was examined, it was found to contain a certain amount of fluid, and it crepitated freely, obviously because there was a large number of vegetations in it. In a man of 30 years of age, the subject of gonococcal arthritis, vegetations are distinctly rare. But, at the same time of life, the common

characteristic of osteo-arthritis (so-called), especially in the knee, is the existence of vegetations. As a matter of fact, in patients of about 30 years of age, with osteo-arthritis, one of the commonest characteristics is the formation of vegetations in the joints concerned, especially when, after multiple arthritis, the disease has concentrated itself in one articulation and remains there. This man, locally, had all the indications of a knee full of vegetations, such as those met with in osteo-arthritis occurring at his time of life. He had none of the signs commonly met with in the other form of arthritis, and, as a matter of fact, the existence of the gonococcus in the water was a mere coincidence, and had nothing to do with the condition of his knee at this time. Had those, who originally saw this patient, approached the case from the local aspect of the joints, it is probable that a bacteriological examination would hardly have been required to complete a diagnosis. As it was, the chance which led to his coming in contact with someone, who happened to look at the case from the local point of view, saved the position.¹

This case also shows very clearly how very long the specific evidences of disease, such as gonorrhœa, syphilis, enteric fever, etc., may remain in an individual and be demonstrable, after all influence for evil has disappeared, and it is a distinct warning against attaching too much importance to the mere existence of evidences of this kind.

The following case is a further illustration of this point. A man was invalided home from South Africa during the Boer War, on account of a swelling at the inner end of one clavicle, a situation in which syphilitic nodes or gummata are common. He had suffered from enteric fever, some months previously, but had completely recovered and returned to the fighting line. Two years before this attack of enteric, he had had another severe attack in this country. Regarding the case from the local aspect, the signs were characteristically those of gummatous node. A blood test having been made, Widal's reaction was stated to have been obtained. It was, therefore, strongly urged that the condition was not syphilitic, but post-enteric osteomyelitis, not because the local condition resembled it, but because of the evidence in his blood of the existence

¹ The joint was subsequently opened and a considerable mass of vegetation removed, after which the knee resumed for practical purposes its normal function

of a specific indication standing over from an attack of enteric fever months before. An exact parallel, in this respect, to the preceding case. Upon laying open the breaking-down swelling on the clavicle, I found the abscess, for such it had become, on the surface of the clavicle, and not in its substance, as it would have been in the case of post-enteric osteomyelitis. Moreover, the operation wound showed no sign of final healing, until a course of iodide of potassium had been taken, which conclusively demonstrated the nature of the case.

This matter is equally interesting, when regarded from the opposite point of view, as is shown by the very interesting case of a girl who, when I saw her, was 23 years of age. She had chronic disease of the knee, which had all the characters of a tuberculosis. It was in the early stage. There was no displacement or anything of that kind, because the disease had not progressed sufficiently far. The various available tests for tubercle were applied, and, oddly enough, none of them reacted, so far as I can recollect. Amongst others, one upon which considerable value was placed, was the fact that fluid drawn off from the knee joint was quite sterile, and contained no evidence of tubercle bacilli. The general result was a conclusion that the case was not of a tuberculous nature. It was not unreasonable that this opinion should have been arrived at, because the patient's history was very clear. The various tests showed no reaction worth mentioning, and, finally, the fluid from the knee-joint was free from tubercle bacilli. Nevertheless, the local symptoms were those of tuberculous disease of the knee, and, had I been asked to make a positive diagnosis, I should have diagnosed the case as such, and should have treated it accordingly. But, in the face of these negative results, especially the absence of bacilli in the fluid withdrawn from the knee, the suggestion of tubercle was for the time being set aside. Of course the fact that, if a joint is tapped, the fluid withdrawn contains no tubercle bacilli is no evidence that there are no bacilli in the joint, because the common habitat of the bacilli is not the fluid in the articulation but the synovial membrane. That is, of course, only a detail, but the case shows the converse of that which I mentioned just now, in which positive bacteriological evidence was deceptive. In this case the negative results of bacteriological examination were also deceptive,

as was shown in the course of the next eight or ten months, during which the joint condition steadily progressed, and developed into an ordinary tuberculous knee, with breaking down of caseous patches which, in the meantime, had formed.

These two cases show, from opposite points of view, the same truth, the second one being particularly important in demonstrating the comparatively small value of negative evidence. In bacteriological and other examinations, if a positive result is obtained, there is reason, supposing that sources of fallacies are eliminated, for believing that the evidence is of value; but negative results are of relatively little value, and the diagnosis is finally dependent upon clinical knowledge.

We are too prone, in these times, to conclude without sufficient reason, that chronic joint affections are tuberculous; we are over-ridden by the idea that any disease, which is more chronic than usual, must be tuberculous. And we have come to rely also upon certain tests, which are supposed to indicate whether the existence of tubercle is likely or no. I say likely, because I do not think that any of them are absolutely certain. This tendency to consider chronic disease, as necessarily tuberculous, is extremely unfortunate, because it sometimes leads to faulty treatment. The long immobilisation of joints, suspected to be the seat of tubercle, for example, is, in ordinary circumstances, I think, frequently unwise. And when they are not tuberculous prolonged immobilisation is, of course, the thing to be avoided, because, speaking generally, it is the worst possible treatment which can be applied. It is therefore, necessary to be very careful, in cases of chronic disease, before we allow ourselves to be led to consider that they are tuberculous, and certainly before we allow ourselves to adopt a treatment such as prolonged immobilisation. With regard to the early tuberculous disease of joints, with the exception of the hip, spine, and pelvic articulations, I think that it is a question whether immobilisation is, in a general way, the best treatment. As a rule, the moment a joint is suspected of being the subject of tuberculous disease, it is put into an immovable apparatus, to be kept there for 6, 8, 10, 12 or even 18 months, as the case may seem to require. If that were the only way of curing tubercle, supposing the disease to be certainly tuberculous, that would naturally be an excuse

for the treatment. But there are now, at all events, other treatments which, in my experience, deal quite as well with early tubercle in the knee, elbow, ankle, wrist, tarsal, carpal, and other distal joints as prolonged immobilisations. And it must be remembered that these immobilisations, even supposing they "cure" the patient, often ultimately leave the limb wasted and defective, and the joint, perhaps, incurably stiff. One of the weak points in the results of treating these tuberculous, or supposed tuberculous, joints by long immobilisation, is that when it comes to the subsequent dealing with a joint which is thought to have been cured, the breaking-down and other measures, necessary for restoring the usefulness of the limb, sometimes result in recrudescence of the disease. That is not a very uncommon experience. Therefore, in the earlier stages of suspected tuberculosis, I think that the method of induced hyperæmia and massage is in appropriate situations a better means of attacking tubercle than the immobilisation process. But, before committing oneself to the treatment of a tuberculous condition, it should be more or less certain that tubercle is there; and it is interesting to note that this is not necessarily proved by the fact that the patient happens to react to one of the several tests for tubercle. The following is a striking illustration of this fact: A child, 13 or 14 years of age, was travelling on the Continent with her parents. After walking, she complained on several occasions of pain in one foot, which was noticed to be swollen. She was abroad for six months or so, and was seen by two or three practitioners on the Continent, the last of these being a recognised authority on tuberculous diseases. The child was examined very carefully, Calmette's test was tried, it was stated in a letter which was handed to me to read, with the result that the ordinary reactions were obtained at the usual intervals of about a week. The child looked, as she limped into the room, as healthy as could be desired. Upon examination, it was found that there was swelling on the inner side of the tarsus, a little sensitive to the touch, and causing, when she walked, pain which shot up along the outer side of the ankle and calf. As a matter of fact she had, so far as I could tell, all the characteristics, and only the characteristics, of a rapidly increasing flat foot. On examining the other foot, in which she said she occasionally

felt pain, it was obvious that it was also beginning to undergo the change towards flat foot. It would hardly seem possible that a man of great experience could have been so misled in the diagnosis. The association of factors in this conclusion was, however, clearly as follows: (1) A practitioner, whose special line of work led to a mental mood tending to a bias towards tuberculosis, (2) a swollen and tender foot in a child of a suggestive age, and (3) a reaction, commonly supposed to be characteristic of tuberculous conditions, following upon a recognised test. These, with an obvious failure to appreciate the significance of the local condition, led to a diagnosis, the result of which was a recommendation to immobilise the foot for 18 months, a recommendation which caused the parents to bring the child to London for further advice. The treatment adopted here was that for valgus, viz., massage and exercises, which resulted in restoring the normal condition, a metal valgus brace being subsequently worn for some months.

Apart from the immediate moral of this case, it is a further evidence of a fact, to which I have already referred, namely, that because a patient may be constitutionally non-resistant to tubercle, it does not necessarily follow that inflammation about a joint or other part should be of a tuberculous nature. Although I cannot help feeling that there is, at present, an unfortunate tendency to attach too little importance to bedside diagnosis, and to rely too exclusively upon the decisions of the Bacteriological, or Pathological Laboratory, no one values these more than I do as a rational help, because it is our bounden duty to utilise every means at our disposal to establish accuracy in diagnosis, upon which successful treatment can alone depend. And by-and-by, when we arrive at a state of affairs, in which the practitioner at the bedside will consult, on the spot, with the pathologist, or bacteriologist as the case may be, a means of arriving at a diagnosis will be forthcoming which will, from the scientific as well as from the practical aspect, be ideal. But, so long as the two are absolutely separated, there will always be danger of mistakes occurring, if too much importance is attached to either the one or the other. The great point which I wish to insist upon now, is the desirability of, as soon as it is feasible, bringing into more immediate contact the clinical observer,

on the one hand, and the laboratory expert on the other. But I still think, although I fear that it is a heresy to say so, that, all other things being equal, the ordinary practitioner will, in the long run, find a comprehensive clinical knowledge, rather than the help of the laboratory, aid him most in times of need.

Returning for a moment to the question of immobilisation in suspected tuberculous disease of certain parts, it is not infrequently said that, supposing immobilisation be carried out in a case which proves not to be tuberculosis, it is of little consequence, since the patient will recover, which is all that is practically required—a truism of course. But the immobilisation, for long periods, of a joint, the subject of ordinary inflammation, is liable to produce ankylosis, or at all events so much stiffness that some hesitation may be felt in dealing with it in the radical way necessary to reproduce a useful articulation. In this matter of stiffness after immobilisation, however, it is sometimes easy to be deceived, as the following very instructive case proves. A sailor, 25 years of age, had some injury on board ship, followed by chronic inflammation of the knee joint. It was concluded, rightly or wrongly, that the disease was tuberculous. I do not know whether it was really so, because I did not see the patient at the time and had no means of ascertaining from those who treated him. At all events, the knee was immobilised for some months, the result of which was that the inflammation and pain disappeared but left a perfectly stiff joint. When I saw him with the view to something being done in order to get movement in the joint, he appeared to have an absolutely stiff limb, with wasted muscles above and below, and, so far as one could tell without an anæsthetic, a joint which was completely ankylosed. An X-ray picture having been taken, the joint appeared to be normal, but unfortunately the photograph was not a very good one, and therefore not so conclusive as it might have been. An anæsthetic was administered, and with a little perseverance, though with a great deal of difficulty, the knee was bent to its full extent, and, in a few days, he was walking about with normal movements, although of course with a wasted limb. Here was a case in which, after months of immobilisation, the joint was apparently ankylosed. Had the case been one of real tuber-

culosis, it would probably have been dangerous to break the knee down. It was therefore an important question whether it was wise or unwise to attempt to forcibly bend the knee in those circumstances, and, in doing so, of course, a certain amount of risk was run. Still, risks have sometimes to be taken, and seeing that the whole limb, at the time I saw it, was so healthy, except for the wasting, that there was no abnormal local heat, and that, by the X-rays, I could see no certain change, I thought it right to take the risk, and I did so, with the result described. One of the main reasons for my mentioning the case is, that it raises the question as to the correctness of the original diagnosis, although I have no doubt whatever that the treatment, in the circumstances, was wise. It is unlikely that a case of tuberculous disease, which had been in existence, I think, 9 or 10 months before the treatment was undertaken, would have recovered so completely as to allow the joint, after being broken down at the end of 18 months, to be perfectly smooth in its movements. Immobilisation, if employed in the early stages of distal joint disease in the extremities, should be reserved for undoubted cases of tuberculosis, and, even in these, other methods, often equally good, are available. I could mention for example several apparently tuberculous cases of distal joint disease which, under the hyperæmic treatment and massage, have recovered in the course of a few months as perfectly as any joints could recover under immobilisation no matter how long continued.

Such are the points which seem to me to justify the following conclusions:—

First. In diagnosis, neither the history of the case nor constitutional taint in the patient should be allowed to override the value of local appearances.

Second. The results of laboratory investigations carry comparatively little independent weight, unless coupled with a very careful consideration of the clinical conditions.

Third. Objective manifestations of abnormality, occurring in more than one situation at the same time in a person the subject of a constitutional taint—for example, syphilis or tubercle—are not necessarily of the same nature.



NOTES FROM A CLINICAL LECTURE ON
ADDISON'S DISEASE.¹

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ADDISON'S disease is named after the great Addison, and his discovery illustrates the power of observation, which after all is that upon which medicine is based. Nothing was known of the disease until Addison observed eleven cases of people who were pigmented, sick, and weak, and he was able by observation to predict what would be found at the autopsy. He says in reference to it:—"The leading characteristic features of the morbid state to which I would direct attention are anæmia, general languor, and debility, the remarkable feebleness of the heart's action, irritability of the stomach, and a peculiar change of colour in the skin, occurring in connection with the diseased condition of the supra-renal capsules. The patient, in most cases I have seen, has been observed to gradually fall off in general health, he becomes languid and weak, indisposed to either bodily or mental exertion, the appetite is impaired or entirely lost, and the whites of the eyes become pearly, the pulse small and feeble, but excessively soft and compressible. The body wastes; not, however, presenting the dry shrivelled skin and extreme emaciation usually attending malignant disease. Slight pain or uneasiness is from time to time referred to the region of the stomach, and there is occasionally actual vomiting. Notwithstanding these unequivocal signs of feeble circulation, anæmia, and general prostration, neither the most diligent inquiry, nor the most careful physical examination tends to throw the slightest gleam of light upon the precise nature of the patient's malady, nor did we succeed in fixing upon any special lesion as the cause of this gradual and extreme constitutional change."

When he says "we did not succeed in fixing upon any special lesion" he means during life, as the context shows. The following cases of two women illustrate this description:—

Case 1.—The first is 37 years of age; she was admitted on the 27th of October for pigmentation of the skin and weakness. There is no history of tuberculosis in her family. Her friends noticed the pigmentation of the skin for the first time three months ago. She does not actually vomit,

¹ Delivered at Guy's Hospital, and specially reported by THE PRACTITIONER.

but feels very sick when she gets up and walks about, and she has nausea while lying down, and seems listless. The pigmentation of the skin is well marked on the face, on which there is a peculiar brown pigmentation. Not only is there a brown pigmentation, but here and there are darker splashes on it. The conjunctiva is not pigmented. The brown discoloration is seen also on her arms and chest. Both nipples are very dark. The colour shows deepest on the nipples. The darkness is particularly striking in the axillæ, which is one of the favourite seats for the pigmentation of Addison's disease. The dark pigmentation with darker spots can also be observed on her waist, and there is a dark pigmentation on the shoulders. She is not well pigmented on her lower extremities, but there are one or two dark patches there. There is a patch of pigmentation on the tongue, which is a most unusual occurrence, and in her mouth the abundant pigment on the mucous membrane of the cheeks can be seen.

Case 2.—This woman does not show quite so well in this light, but she also has the dark pigmentation. Both nipples are deeply pigmented. Her darkness is different from that of the other, inasmuch as it is not so uniform. There are more dark patches on the rather lighter dark ground—to use an Irishism. There is abundant pigment on the mucous membrane of her mouth. A very interesting point is that she has a pigmentation in a very rare place; she has it in the finger nails, and I have never before come across a case in which the pigmentation was so situated.

Each of these cases possesses a very rare feature—one having pigmentation on the tongue, and the other on the finger nails. The pigmentation is darkest in those places where the skin is inclined to naturally go into folds, for instance, the axillæ. Further, in both cases, the pigmentation is very pronounced on the genitals. In men, it is well marked on the penis, and between the scrotum and thighs.

Both women are very weak, their cardiac beat is very feeble, and their arterial pressure is low. For instance, in Case 1, the blood pressure on the 10th of this month was 93, and her blood pressure is now only 100, and in Case 2, the blood pressure has been taken many times, and it has been as low as the seventy-fives and eighties. It is now 110. Both women have been sick, and have complained of a pain in the region of the epigastrium. The elder is wasted.

The first symptom to be observed is the general pigmentation of the skin. The pigmentation is the darker in Case 1, but both have the pigmentation very dark on the nipples. It is often dark over the genitals, in the flexures of the knees and the elbows, and very dark indeed where there is any pressure, for instance, in the case of a man, the pressure of the braces, and, in the case of a woman wearing garters, the pigmentation would be also found from

the pressure of these. The first woman had a series of lines of pigmentation just where she would get the pressure of the stays. There is also usually pigmentation over the bony prominences. The pigmentation of Addison's disease is frequently seen on the mucous membranes of the mouth. I have never seen it on the conjunctiva, but I have on the tongue, on the nails, and last year I showed you it on the glans penis. It is usually a general brown pigmentation, with much darker patches scattered about. In his book Addison described it as "a dingy or smoky appearance, of various tints or shades, of deep amber, or chestnut brown. And, in one instance, the skin was so universally and deeply darkened that, but for the particular features, the patient might have been mistaken for a mulatto."

The next symptom is the weakness. The first woman complains very much of her weakness. The report says about her that she is very weak and complains of it considerably. I may point out, on the other hand, however, that the young girl, Case 2, is as yet not very weak, but I am sorry to say that sooner or later she will become so. The general lassitude extends to the pulse, and Addison made a great point of the fact that the pulse was normal in rate, but very feeble and weak, and the only advance, which we have made in defining the symptoms of the disease since his time has been to estimate the blood pressure and prove what he said—that the pulse is weak—by the low blood pressure records.

The third symptom is the wasting, and Addison made a strong point of this. He particularly said that it was not the dry shrivelling skin of other wasting diseases. In our two cases both the women are thin, both have wasted, the latter was on November 4, 8 stone 3 pounds; on November 8, 8 stone 1 pound; on November 18, 7 stone 10 pounds. Hence there is wasting, though it is not the wasting of malignant disease.

The other symptom, described by Addison, is that there is sickness with pain or uneasiness from time to time in the region of the stomach. Both the women suffer from sickness and pain in the stomach, and both have complained of nausea. There is no disease in medicine which has fewer symptoms. It is commoner in men than in women, in the proportion of 65 per cent., and the usual ages are from 30 to 60. You will thus see that you have had two very rare and interesting cases

before you ; both the cases are women, and one of them is a young woman of 17.

The question may arise, are there any difficulties about the diagnosis of Addison's disease ? There are several.

The first thing to be considered is whether we can go wrong about the pigmentation of the skin. There are many sources of error. Addison's book, which contains the description of the disease bearing his name, also contains an account of pernicious anæmia, indeed it was while looking for the one that Addison found the other. The most common fallacy, perhaps, is to mistake Addison's disease for pernicious anæmia, but I would remind you that, in most cases of pernicious anæmia, the skin is of a lemon tint, and that, in Addison's disease, the skin is brown. The points of distinction between the two diseases to be borne in mind, however, are that people with pernicious anæmia never get pigmented on the mucous membranes, and, further, that, nowadays, there can be no excuse for a mistake being made, because no one would think of diagnosing pernicious anæmia without a proper examination of the blood. In this connection, I must specially emphasise that it must not be concluded that a patient has not got pernicious anæmia from a single examination only of the blood. The blood varies very much from time to time, and before it can be determined that the patient has not pernicious anæmia, several films, taken at different times and on different days, must be examined.

The second difficulty is that of distinguishing between a patient, who is pigmented because he has taken arsenic, and one suffering from Addison's disease. There are very many cases in which it is quite impossible, from only looking at a patient, to differentiate between the two. The people who have taken arsenic get a brown pigmentation of the skin, with darker spots scattered about, exactly the same as in Addison's disease, but those who have arsenical pigmentation never get pigmentation of the mucous membranes, hence a careful examination of the inside of the mouth becomes a fundamental point. In addition, there will usually be the history that the patient has taken arsenic. A look into the mucous membranes of the mouth will put us right.

Then another difficulty which occurs is that people with malignant disease are very likely to get pigmented. In

practical medicine we often have to consider whether the patient has some malignant disease or Addison's disease. And, inasmuch as the malignant disease, when invisible, is usually in the abdomen, and the patient complains of nausea and sickness, differential diagnosis becomes difficult. But a patient with Addison's disease is not so excessively wasted as is the patient with malignant disease, and, in the latter case, evidence of malignant disease is usually found somewhere in the body. Further, the mucous membranes and the darker spots will assist ; but, if these do not help, the case must be carefully observed for some time, so that other symptoms may appear, thus making the diagnosis easier.

Another difficulty, which has arisen, is that people suffering from phthisis have been pigmented a light brown colour, and in this connection, also, a very careful examination is essential. Generally, however, there should not be any serious difficulty in diagnosis, because, if tubercular, the physical signs usually become obvious. Again, we are liable to see, from time to time, dirty people, who are infected with lice, darkly pigmented. Fortunately for the diagnosis, these people are usually so obviously filthy that no difficulty arises.

There are a few other difficulties. For instance, sometimes in syphilis there may be a slight staining of the skin. It should not, however, give rise to any difficulty. Then, in that rare disease—Hanot's cirrhosis of the liver—although the skin is pigmented, it cannot give rise to any difficulty because of the large liver. There is, further, that very rare disease called bronzed diabetes, but no error need arise here, because of the sugar in the urine. So practically the position is this:—"Is the patient suffering from Addison's disease, pernicious anæmia, or arsenical pigmentation? And, after what I have said, I venture to think that there will not be very great difficulty in making a correct diagnosis.

Addison said that whenever a patient has the pigmentation I have described, and also has a very weak pulse, with nausea and vomiting, the supra-renal capsules will be found to be diseased. I show you here a number of specimens showing this disease of them.

By far the commonest disease of the supra-renal capsules to cause Addison's disease is tuberculosis. Addison's original cases were eleven in number. Five showed caseous tubercle

in both supra-renals, one showed caseous tubercle in one supra-renal, one showed cirrhosis with atrophy of the supra-renals, and three were examples of malignant disease of the supra-renal body. In the lungs or bones, there is often evidence of tubercle in Addison's disease. Addison himself thought that malignant disease of the supra-renal capsules would cause the disease. Then a wave of opinion sprang up, which taught that the change in the supra-renal capsules in Addison's disease must be a caseous tuberculous change; but Addison had a wider conception, and thought that any disease, which impaired the functional activity of the supra-renals, would cause the disease that bears his name. And he has turned out to be correct, because we now believe and know that any lesion of the supra-renal will, if sufficiently extensive, produce Addison's disease, whether it is tuberculous disease or malignant disease. But subsequent experience shows that he had an exceptionally low proportion of tuberculous supra-renals among his cases. There is no doubt that tubercle overshadows all others in its frequency as a cause of Addison's disease, and that leads us to another point, which I want to emphasise, viz., that those patients frequently have tubercular disease elsewhere, such as in the spinal column, usually in the lumbar region.

Not every case, in which the clinical symptoms are such that it is difficult to resist the diagnosis of Addison's disease, that has ever been published shows disease of supra-renal capsules. In the books, it is stated that only 88 per cent. of the cases of Addison's cases are found, post-mortem, to have disease of the supra-renals. I am not surprised at this statement, for, in the first place, patients are sometimes said to have Addison's disease when they have not; in the next place, I have seen people make post-mortem examinations in a very careless way, so that disease of the supra-renals may be overlooked, and these two facts will certainly account for some of the 12 per cent. Further, there is the possibility that the supra-renal function might be disordered without any actual disease existing. Again, another thing that we now know is that chromophile cells, very similar to the cells in the medulla of the supra-renals, are found in several situations, for instance, in the small inter-carotid glands which we have on either side of the neck, and in the coccygeal

glands. Perhaps very rarely disease of these glands may cause Addison's disease, and lead to death before the supra-renals are affected. It may possibly be that when disease is found in the supra-renals, and yet no Addison's disease has been present, the cells of a similar nature elsewhere in the body have been able to form enough internal secretion to prevent the patient from developing Addison's disease.

Addison had the idea that what was the matter with a person with disease of the supra-renal capsules was that, owing to the disease, something which ought to be secreted into the blood was not present. We know now that this is the case; the medullary part of the supra-renal capsules secrete a substance which is called by various names, viz., adrenalin, epinephrin, suprarenin. I cannot explain why the absence of adrenalin in the circulation should cause pigmentation, but it does explain the low blood pressure and the general feebleness.

The suggestion has been made that the reason why these people are sick is because the solar plexus is so near the adrenal bodies that it is implicated in the supra-renal disease. I have cut a great many hundred sections of the semi-lunar ganglia, and I do not think that there is any evidence that implication of them will explain the vomiting. Certainly many cases have no particular affection of the solar plexus nerves. Perhaps the vomiting is due to the low blood pressure.

One interesting suggestion has been made, namely, that Addison's disease is more common than we imagine, and that some people, thought to die from other diseases, really die in the early stages of Addison's disease. Many, when dying, have a very low blood pressure, and the heart becomes feeble, and one of the causes of death may be the insufficient supply of adrenalin. At any rate, many people do die with a low blood pressure.

With regard to the prognosis, that is uniformly bad. If, at the end of two or three years after the diagnosis of Addison's disease has been made, the patient is still alive, the chances are very great that the diagnosis was wrong.

With regard to treatment, we can do very little. It seems so natural to give adrenalin that we do so, and it must be given subcutaneously. Both the cases considered above have had it. The blood pressure has increased a little, but that the use of this drug will defer the end I very much doubt.

FACT AND FICTION, OR THE PROGNOSIS IN CASES OF FRACTURE.

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PERHAPS nothing appears stranger to the scientific observer than the intense difficulty with which people discard their beliefs, and the extraordinary pains that they will take to delude themselves and others by making statements, which they imagine they believe to be true, and which they hope to induce others to accept as true.

Those, who make these assertions in the hope of deluding themselves and others, are not necessarily stupid, ignorant, or untruthful, but are frequently conscientious, very intelligent, and high principled. They actively resent, almost as a personal insult, any opinion that differs from their own, and will employ any artifice, often without much scruple, in their attempt to upset it.

Unfortunately accuracy in observation is sacrificed altogether to general statements which are employed quite unconsciously without any regard whatever to truth. One would not for a moment attribute wilful desire to misrepresent fact, since the disposition to oppose any alteration in creed or belief is innate in man.

I would illustrate my meaning by the various assertions concerning the results of the treatment of fractures by manipulation and splints, which have been made, from time to time, by surgeons of great eminence and experience.

In 1894, when I brought before the Clinical Society a paper dealing with the results of the treatment of simple fractures by operation, I pointed out that operative measures offer to the patient the following advantages:—

“(a) They at once relieve the patient from the pain of any movement of the fragments upon one another.

“(b) They free him from the tension and discomfort due to the extensive extravasation of blood between and into the tissues.

"(c) They shorten the duration of the period during which he is incapacitated from work, since union is practically by first intention, and, consequently, very rapid and perfect.

"(d) Lastly, and by far the most important, they leave his skeletal mechanics in the condition in which they were before he sustained the injury."

In that paper I gave the reasons, according to which I advised operation in suitable circumstances, and appended a list of results of cases, treated by manipulation and splints, which were most unsatisfactory. These were taken in sequence from the reports of the hospital, and extended over a considerable period of time.

This, and the papers which I wrote later, raised a storm of opposition, and have practically continued to do so up to the present time.

I do not propose to deal with the results of operation in this communication, as I have already very frequently done so.

I merely wish to show that the vast majority of statements, which have been made as to the satisfactory results of treatment by splints and manipulation, are not deserving of serious consideration.

The conclusions, which I arrived at as to the prognosis of fractures, were briefly the following :—

(1) That accurate, or anything approaching accurate, apposition of displaced fragments in a fracture was obtained in only very rare cases.

(2) That the treatment of fractures, as it existed, was a disgrace to surgical practice, because those, who had sustained fractures, especially of the leg, only too often experienced enormous physical disability. When dependent on labour for their income, they frequently suffered great financial depreciation in their wage-earning capacity. In not a small proportion the depreciation in certain occupations amounted to 100 per cent.

All my subsequent experience of fractures, treated by means other than operative, has fully borne out the accuracy of the statements which I then made.

As illustrating the attitude taken up in reference to the impossibility of restoring the displaced ends of broken bones

to their normal relationship, I will quote remarks made by surgeons of great experience and repute.

¹“I would remind you how important it is, in fractures of the leg particularly, that *the fracture should be set thoroughly and accurately*. Of course I well know that there are many difficulties. Immediately after the accident all the muscles of the limb are more or less in a state of spasm, and tend, therefore, to pull the bones into abnormal positions; but that state of spasm passes off in the course of a few hours, and you can generally manage, with care and patience, to put the limb in a proper position; and unless that is done, and done accurately, the surgeon has not treated the case properly.”

Another surgeon of high repute and experience writes:—

²“Having arrived at a full and correct diagnosis, the next point to attend to is to reduce the fragments at once, at the earliest possible moment, remembering that lapse of time always increases the difficulties in doing this, never lessens them, and even makes them insuperable. *This reduction of the fragments must be complete or perfect at once*; we must not rest in any half-way house, content with improvement to-day in the hope of still further correction to-morrow.”

I might multiply these statements as to the possibility and necessity of bringing the fragments into perfect apposition, but will content myself with what I have quoted as they represent accurately the teaching up to that date.

This was persisted in by surgeons till the discovery of the X-rays. How completely the use of this very perfect method of diagnosis has altered the creeds of surgeons as to the necessity of obtaining accurate apposition is very well illustrated by the following quotation.

³“He thought surgeons should be very guarded in their language when they laid down rules on the management of fractures now that the general public were so ready to take actions at law. The public should be made to clearly understand that perfect end-to-end apposition is only rarely secured

¹ *Lancet*, January 4, 1896.

² *Lancet*, June 12, 1897.

³ “Diagnosis and treatment of fractures of long bones,” *The Clinical Journal*, June 17, 1908, p. 156.

and that fractures were not 'set' in the popular sense of the term."

I cannot say that I have been very favourably impressed by the attempts which have been made by many surgeons to disparage the advantages afforded by X-rays, and to cast doubts upon the accuracy of skiagrams. Personally I have found none of the difficulties described, but regard their use as an accurate and an invaluable aid to diagnosis.

Now as to the after-effects of the treatment of fractures by manipulation and splints.

In 1900, an eminent surgeon was asked to open a discussion at the meeting of the British Medical Association held at Ipswich in August of that year.

He took endless pains to obtain from a summary of the opinions of about three hundred surgeons some information as to the results of treatment of fractures by non-operative measures.

I take the liberty of quoting at length from his excellent address, since he puts the views he held so clearly, supporting them by some very definite statements of other surgeons.

"A practical question, which is second to none in importance, is that of the disabilities which follow upon fractures, especially in relation to the effect upon the wage-earning power of the individual. A consideration of it is therefore unavoidable in the present discussion. With a view to arriving at a useful conclusion on this point, I was careful, in circulating my inquiries, to include amongst those, to whom I applied for information, a number of practitioners working more particularly in mining and colliery districts, because it appeared to me that they would be in a better position than most of us to give information as to the effect produced by fractures upon the wage-earning power of the individual, not only because the fracture experience of such practitioners must necessarily be large, but also because, from the circumstances in which they practice, the patient often remains under their notice for what is practically the rest of his life. I also took the opportunity of inquiring amongst those who have to do with sailors in large numbers, who have suffered from fractures at sea and under other disadvantageous circumstances, in which the difficulties connected with their proper

treatment necessarily lead to union in faulty positions more or less frequently."

"The result of my inquiries in this respect is that I find the real disability following upon fracture is not so great as one would be led to suppose from recent writings on the subject. It is, for example, distinctly stated by a surgeon, who has perhaps a better opportunity for observing badly united fractures and conditions of that kind in sailors of all nations and in all circumstances than perhaps any other, that he had not noticed any particular disability in this class of patient, and that in fact the majority of the seafaring people with whom he has to deal, who have been subjected to fractures, although the union may in the true surgical sense be faulty or even vicious, are able to earn their full pay as ordinary seamen."

"The exact words used are as follows: 'We see here a great many cases of old badly-united fractures of leg bones, such as those treated at sea, and, after careful inquiry, I have never yet been assured, excepting, of course, cases of greatly exaggerated deformity needing osteotomy, of serious incapacity or of interference with the full discharge of the onerous and active work of a sailor.'"

"A surgeon of extensive colliery practice writes that his experience, extending over many years, shows that the diminution in the wage-earning capacity is 'practically *nil* in fractures of the upper extremities, and *very little* in fractures of the lower extremities,' and he believes that 'diminution of wage-earning capacity is much overstated in text-books.'¹ 'This,' he says, 'is my experience in a large number of cases occurring in colliery practice, in which I have had the injured under my observation practically all their lives.'"

"Another colliery surgeon of large experience writes: 'Have seen no permanent diminution in young men, but in old ones sometimes in compound comminuted fractures of both bones of the leg.'"

In support of these dogmatic assertions, the following answers to a definite question are quoted:—

"QUESTION 3.—What is about the average time which elapses in your practice after the occurrence of the injury before the patient is allowed to

¹ I have endeavoured to find some such reference to this subject in the various text-books without success.

resume his ordinary calling in simple fracture—

- (a) Of the femur? (b) Of the leg (both bones)?
(c) Of the humerus? (d) Of the forearm (both bones)?

LONDON.

FEMUR.—Extreme periods mentioned,
8 and 12 weeks.

32 per cent. 12 weeks (standard).

50 „ less than 12 weeks.

10 „ more than 12 weeks.

Remainder indefinite.

LEG (both bones).—Extreme periods,
6 and 16 weeks.

33 per cent. 6 weeks (standard).

57 „ more than 6 weeks.

Remainder indefinite.

HUMERUS.—Extreme periods, 2 and 8
weeks.

30 per cent. 4 weeks (standard).

42 „ more than 4 weeks.

15 „ less than 4 weeks.

Remainder indefinite.

FOREARM (both bones).—Extreme
periods 3 and 8 weeks.

34 per cent. 4 weeks (standard).

52 „ more than 4 weeks.

14 „ less than 4 weeks.

PROVINCES.

FEMUR.—Extreme periods, 6 and 36
weeks.

60 per cent. 12 weeks (standard).

25 „ less than 12 weeks.

15 „ from 16 to 36 weeks.

LEG (both bones).—Extreme periods,
3 and 16 weeks.

34 per cent. 8 weeks (standard).

45 „ more than 8 weeks.

16 „ less than 8 weeks.

Remainder indefinite.

HUMERUS.—Extreme periods, 3 and
12 weeks.

38 per cent. 6 weeks (standard).

27 „ 8 weeks.

20 „ more than 8 weeks.

15 „ less than 6 weeks.

FOREARM (both bones).—Extreme
periods, 3 and 16 weeks.

30 per cent. 6 weeks (standard).

20 „ 8 weeks.

46 „ less than 6 weeks.

4 „ more than 8 weeks."

Glancing at the several answers, one cannot but be struck by the fact that London surgeons and provincial surgeons differ from one another in accuracy or professional capacity, or that they have to deal with patients who react to the same treatment in very different ways, or that the efficiency of the labourer is gauged at varying standards in the town and in the country. For instance, out of a hundred fractures of the femur, treated by provincial surgeons, every patient was able to resume his ordinary calling in 36 weeks. On the other hand, half the patients of the London surgeons were enabled to resume their occupation in less than 12 weeks, while only one quarter of those treated in the country were able to reach such a condition of efficiency in that time. Therefore in the country patients take longer to get well.

In fractures of both bones of the leg treated by provincial

surgeons, 95 per cent. of the patients were able to resume their occupations in 16 weeks from the receipt of the injury, while 50 per cent. were able to work in eight weeks.

I do not propose to criticise these statements beyond saying that they correspond in no way whatever with the observations I have made on a very large number of fractures not treated by operation. Apart, however, from my own experience, I turn to an address which was delivered by Mr. Clinton T. Dent before the Medical Society of London, published in the *Clinical Journal*, Wednesday, October 7th, 1908.

In it he deals with the after results of fractures of the bones of the leg. I quote from the *Clinical Journal* the following extracts:—"Recovery from the point of view of the surgeon and that of the patient does not always coincide in date. The standard of efficiency is high in the police, the class of men principally under consideration. The work demands fair activity; thus for either two periods of four hours, or for one tour of eight hours, a man must be continually on his legs day after day, though with frequent short spells of leave. Judged by this standard and desirous of keeping well within the mark, my estimate is that at least 30 per cent. fail to attain this standard after simple fracture of both bones of the leg; very few regain it under six months. Fracture of the leg, involving the knee or ankle-joints, or fractures of the femur, uniformly lead to permanent unfitness for the work that devolves on these men; fractures occurring in the neighbourhood of these joints nearly always have the same result. I can hardly recall a case of Pott's fracture, or a Dupuytren's fracture, where recovery has been complete enough to enable a man to resume police work. My experience with regard to fractures of the leg has led to the expression of rather gloomy, perhaps pessimistic, views."

Personally, I can only say that I am entirely in accord with Mr. Clinton Dent, but I have no hesitation in leaving the matter to the judgment of the profession.



MYXŒDEMA.¹

BY GUTHRIE RANKIN, M.D., F.R.C.P.,

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IN 1875, Sir William Gull first directed attention to an unclassified disease, which he referred to as "a cretinoid state supervening in adult life in women," and which was fully described subsequently by Ord, who labelled it Myxœdema on the ground that an œdema consequent upon the accumulation of mucin in the tissues was the leading and characteristic symptom. The ætiology of the disease is not clearly defined, though heredity seems to play some part in its causation, and a neurotic diathesis is apparently the foundation upon which it is most frequently grafted. Observation and experiment have now both conclusively proved that the thyroid gland supplies to the economy a secretion essential to normal metabolism, and that interference with this secretion, from atrophy or destruction of the gland, is capable of producing either cretinism in children, or myxœdema in adults. Certain points of clinical distinction exist between the two, but they are explained by the different periods of life at which the diseases respectively declare themselves. It is obvious, for instance, that in adults, the body having attained its full development, the arrested growth and peculiar deformity characteristic of cretinous children cannot be produced. The fact that myxœdema is almost entirely a disease which attacks women in adult life strongly suggests some relationship with ovarian activity, and it has long been known that the thyroid gland becomes full, and may be even actively congested, during menstruation. Exophthalmic goitre, which is the converse of myxœdema, appears in earlier life, and a considerable number of cases are on record in which the one diseased condition has followed upon the other. May such a sequence not be plausibly explained by a theory of glandular atrophy following upon active or inflammatory enlargement, the one physical condition being responsible for the production of myxœdema, and the other for exophthalmic goitre?

¹ Clinical Lecture delivered at the London School of Clinical Medicine, Seamen's Hospital, Greenwich.

The thyroid gland consists of two lateral lobes, united by an isthmus, closely applied to the sides of the larynx and trachea, and situated in front of the recurrent laryngeal nerve and the common carotid artery on each side of the neck. The gland is fixed to the trachea and larynx by fibrous tissue, so that it moves with these structures during deglutition. It is richly supplied with blood from the superior and inferior thyroid arteries, and has a large anastomotic lymph system throughout its whole substance. It is invested by a firm capsule, from which fibrous septa extend inwards and divide it into lobules. Its glandular substance consists of closely aggregated follicles, containing the colloid material secreted by the cubical epithelial cells which line the alveoli. This colloid substance is a true secretion, and probably is complex in composition. The thyroid is a ductless gland, so that its secretion can only escape by the lymphatics or veins, and the former have been proved to be the usual route of transference to the general economy.

Though exceptional cases are met with in youth and in advanced life, the average age of incidence of the acquired variety of the disease is between 30 and 50 years. Females are more frequently attacked than males in the proportion of six to one. Several members of the same family have been known to suffer, so that heredity would seem to play some part in causation. The immediate exciting cause of myxœdema is mechanical removal of, or morbid change in, the thyroid gland. The precise nature of the morbid process which attacks the gland is unknown; it may be inflammatory, but it is more probably toxæmic.

The onset is always insidious, but when fully developed, the disorder produces such a change in the personal appearance and mental activity of the patient that its "facies" is pathognomonic. The bulk of the body becomes gradually increased by subcutaneous œdema, which is not like that of ordinary dropsy, since it neither gravitates to the dependent parts, nor pits on pressure. The increase in size is accompanied by nutritive changes in the skin and mucous membranes, by mental obtuseness, and by a peculiar and characteristic drawing speech.

On inspecting a case of myxœdema, the prominent and

striking facts, which at once arrest the observer's attention, are the swollen and sadly expressionless features of the patient's face, her generally stolid aspect, her sluggish and deliberate movements, and her loss of mental brightness. The skin over the whole body is dry, and, in many parts, thickened both in its epithelial and true layers ; it is rough and harsh to the touch, and to appearance yellowish in colour and shiny. There is an entire absence of moisture and normal flexibility, and moles and warts are often present in numbers, especially over the trunk. The features are broad, flabby, and coarse, the skin over the face being translucent, thickened, and abnormally dry. The eyelids are swollen and transparent, the upper ones drooping heavily over the eyeballs, and being surmounted by eyebrows which are unusually arched. The nostrils are flattened out ; the ears enlarged and pachydermatous ; and the lips are thickened and everted so as to destroy the natural curves of the mouth. The cheeks are suffused over the malar prominences by a well-defined reddish flush, which stands out in striking contrast against the surrounding waxy-looking surface. On each side of the neck, above the clavicles, are large elastic projections of hypertrophied, subcutaneous connective tissue and fat. The hands and feet are broad, coarse, and clumsy, so that they become what Gull described as "spade-like." Their enlargement is due to swelling of the subcutaneous tissues, and not to any increase in size of the bones. The hair is stunted and dry ; it breaks and falls out readily, so that more or less extensive baldness develops. The thinning of the hair is not confined to the scalp, but is present also in other situations where hair grows normally. The nails are brittle and ridged ; and the teeth become loose, and are apt to fall out from recession of the swollen gums. The mucous membranes exhibit changes similar to those seen in the skin ; they become thickened, so that, in the mouth, for instance, the cheeks project between the teeth, and are liable to be bitten in all efforts of mastication. The tongue becomes enlarged, and interferes with clear articulation ; and the soft palate, in extreme cases, may get so hypertrophied as apparently to fill completely the whole faucial cavity. Similar changes will be found in all the other mucous membranes which are accessible to inspection.

The subcutaneous œdema may involve the whole body, but it is always most pronounced in the face and neck, though liable to variations both in amount and extent. The temperature is usually subnormal, and the patient complains of cold, and often experiences deadness of the fingers and toes, which are apt to become livid. There is diminution of common sensation, and particularly the sense of accurate touch is impaired. Certain surface areas become, in some instances, completely anæsthetic. The special senses, and especially those of smell and taste, are liable to be perverted, or diminished in acuity. Muscular debility is an invariable accompaniment of the disease. Any form of sustained effort speedily leads to exhaustion, which may be so pronounced that the patient finds it impossible to maintain the erect attitude, or to keep the head upright on the shoulders. Sometimes muscular co-ordination is also interfered with. The gait is slow and ponderous; it may also be slightly ataxic. The reflexes are normal but sluggish. The voice is nasal in quality and monotonous in tone; the utterance is blurred, deliberate, and always slow. Ord pointed out that the myxœdematous patient is often disposed to be loquacious. Mentally she is lethargic, and liable to become suspicious. Her suspicions exceptionally gravitate into actual melancholia or dementia. She has difficulty in collecting her thoughts; ideas come to her slowly, and are equally slowly expressed in words. Her memory becomes impaired. In the early stages of the illness, there is no evidence of visceral change, but in course of time organic lesions may develop. The urine, for instance, which, at first, is of low specific gravity, increased quantity, and deficient in urea, may become, later on, albuminous and loaded with tube-casts; the appetite, at first unimpaired, fails with the progress of the disease; the vascular system, perfectly normal at first, may become degenerate, and permit of serious hæmorrhages during the later history. This tendency to profuse hæmorrhages constitutes a grave risk in the fully developed disease. The heart remains normal, but its impulse is feeble, and there is a constant liability to syncope. In most cases the pulse is soft, slow, and compressible. Menstruation becomes uncertain; in some instances it ceases altogether, in others it recurs irregularly and is excessive.

On careful digital examination, it may be possible to ascertain that the thyroid gland is either diminished in size, or has wholly disappeared, but, in most cases, the thickened and unyielding cutaneous tissues make palpation a matter of difficulty and uncertainty. There is some reason for believing that the atrophy of the thyroid gland is sometimes preceded by enlargement, and many cases have been recorded, in which myxœdema has been a sequel to a previous attack of exophthalmic goitre. Ord says, "I am inclined to think that enlargement of the thyroid, with or without the typical signs of Graves' disease, is much more commonly an antecedent of myxœdema, with contracted thyroid, than is generally supposed." The course of the disease, if left to itself, is a chronic one which may extend over many years and terminate in death from exhaustion, or some intercurrent ailment, but, under treatment by thyroid gland extract, ultimate recovery in the majority of cases ensues.

Myxœdema may be produced by a congenital absence or abnormality of the thyroid gland, the cause of which is unascertained. Thyroid secretion plays an important part in the growth of children, and when the gland is congenitally absent, the victim is almost sure to be idiotic, or to become imbecile. There is an absence of conspicuous symptoms until towards the end of the second year, when it is usually noticed that the child is stunted in growth, and is apparently not thriving. Gradually, the characteristic features of myxœdematous cretinism become developed; the neck is fat and short; the abdomen is protuberant; the lips are thick and everted; the features swollen; the nose, short, broad, and tilted; and the expression dull and stupid. The skin is dry and harsh; the hair short, lustreless, and broken; the mucous membranes are thickened; and the subcutaneous connective tissue is in a condition of solid œdema. The head is small, misshapen, and drooping forward on the chest; the legs short and often bowed, so as to suggest rickets; and the spine is frequently curved antero-posteriorly, giving rise to suspicion of caries. The child is often unable to stand erect; the mouth is open; the swollen tongue protrudes between decayed and ill-developed teeth; and a few grunting syllabic words comprise the vocabulary. Such a

child is irritable, passionate, destructive, dirty in its habits, and mentally dead. The characteristic condition of the skin, mucous membranes, and connective tissues serves to differentiate this from other forms of idiocy.

Kocher, of Berne, in 1883, directed attention to a condition closely resembling myxœdema, which he called *cachexia strumipriva*, and which is liable to supervene upon excision of the thyroid gland; while Horsley's experiments upon monkeys have proved that complete removal of the thyroid in them gives rise to a condition precisely similar to myxœdema in human beings.

The following graphic description, from the pen of Murray of Newcastle, of the effects observed by him upon a monkey, which he had subjected to thyroidectomy, is quoted for comparison with the preceding description of myxœdema as met with in man. "In about five days the symptoms first begin to develop, the early symptoms being entirely nervous; one of the first to appear is a fine regular tremor, which is most easily seen in the upper limbs, but which is also plainly visible in the lower limbs as well, when the animal is held with the feet unsupported. Along with the tremor, there is a marked change in the whole demeanour, which is the more noticeable owing to the lively disposition and active habits of the healthy monkey. There is progressive apathy, with loss of natural curiosity and interest in surrounding objects, while the temper is irritable, interference being resented. There is no loss of activity, and there is increasing loss of muscular power. The attitude assumed is characteristic; the head is bent, the trunk is curved forwards, and the knees are drawn up so that the chin rests upon them, the joints of all four limbs being in a position of flexion. Contractures owing to tonic spasm of the flexor muscles frequently occur, and clonic contractions of groups of muscles are common. In consequence of these symptoms, the gait is stiff and unsteady, and, when the contracture is excessive, the animal is obliged to walk on the heels, owing to the tonic spasm of the flexure of the ankle raising the toes and sole of the foot from the ground. There is a marked tendency to fall over backwards. True epileptic fits of greater or less intensity may occur. There may be a sudden loss of consciousness,

so that, if the monkey is on the perch at the time, it falls to the ground. The temperature, though raised at first after the operation, soon becomes permanently subnormal. During the second and third weeks, the myxœdematous swelling becomes distinct, and, as in man, is most apparent in the face. Both upper and lower eyelids become swollen, and with this there is sometimes transverse wrinkling of the forehead. Both lips are also swollen by the elastic œdema. The skin, more especially of the ears, becomes dry and rough, and the hair may be shed."

One cannot fail to be struck with the close likeness of the phenomena in the two cases: the leading features of mental and physical apathy, elastic subcutaneous œdema, subnormal temperature, coarse dry skin, and loss of hair are common to both.

In cases, in which post-mortem evidence is available, the connective tissue throughout the body is found to have undergone a remarkable hyperplasia, especially affecting its interstitial material. The skin, mucous membranes, and, to a less extent, the glands, muscles, and nerve ganglia, are affected by a similar proliferative change. On examination of the thyroid, it is found shrunken and fibrosed throughout, with more or less complete disappearance of normal glandular substance. Though the pathological change may be accounted for by a chronic interstitial thyroiditis ending in the production of fibrous tissue, with constriction and ultimate obliteration of the blood vessels and alveoli, and complete destruction of the secreting epithelium, it seems more probable, as pointed out by Murray, that the glandular atrophy is the primary event, and is dependent upon the action of some toxic agent, while the fibrosis is secondary, and similar to that occurring in the spinal cord and elsewhere, after destruction of more highly organised structures. There is an excess of mucin throughout the tissues. When a section is made through the swollen skin there is no escape of serous fluid, but the connective tissue is seen to be distended with a transparent, gelatinous substance. The kidneys are sometimes granular, and contain an excess of connective tissue interstitially. In a certain proportion of cases, the heart is hypertrophied, and the arteries are thickened.

In congenital myxœdema, the long bones are shortened, and the cranial bones thickened. The brain is abnormally small, and there is an excess of cerebro-spinal fluid. When untreated, the disease, once established, goes from bad to worse, but under the influence of thyroid-gland extract, improvement speedily declares itself, and a more or less complete cure is effected. "The results," says Osler, "are most astounding—unparalleled by anything in the whole range of curative measures. Within a few weeks, a poor, feeble-minded, toad-like caricature of humanity may be restored to mental and bodily health."

The recognition of the disease is not difficult. Some cases are, in the earlier stages, doubtful, but the administration of thyroid extract for three or four weeks generally clears up the diagnosis. The leading features, which characterise fully developed myxœdema, are so striking that mistake is well-nigh impossible. They comprise: general increase in the bulk of the body; a coarse, harsh, dry skin; swollen, spongy mucous membranes, which bleed readily; elastic, semi-solid, subcutaneous œdema; impairment of the nervous system; a stolid expression of countenance and waxy complexion, with a well-defined blush over each cheek-ridge; a peculiar, drawling, monotonous utterance; broad, clumsy, spade-like hands and feet; supraclavicular swellings; and mental lethargy with failure of memory.

The only two disorders, with which confusion might arise are chronic Bright's disease and acromegaly. In the former, the œdema is fluid, the skin pits on pressure, and there is an accompaniment of albuminuria, and of other urinary evidences of kidney mischief; in the latter the swelling is mostly confined to the face and extremities, and there is no increase in the general bulk of the body; there are no remarkable mental changes; and though the expression may be altered from increase in size of the lower jaw, the normal facial lines and curves are not erased so as to make it wooden; the voice, moreover, though often guttural, is not monotonous; and the thyroid gland frequently remains intact.

In congenital cases, the thickened condition of the skin, the absence of thyroid gland, the facial aspect, the supraclavicular lipomata, and the undeveloped body accompanying

marked mental hebetude, combine to make the differentiation from other forms of idiocy comparatively easy.

Until comparatively recently, myxœdema was regarded as an incurable disease, and was treated ineffectively by all sorts of drugs, according to the indications of each case, or in compliance with the prevailing theory of the day. Referring to treatment at his epoch, Sir William Gull said: "The best suggestions I can make are to let events take their course very much, maintaining the strength by simple regimen and fresh air, and by the occasional or more or less continuous use of such remedies as quicken the peripheral venous circulation, hot-air bath or warm bath, frictions, etc., but the general good effect will, I think, be limited."

Attention to the value of thyroid gland or its extract, as a curative agent, was first aroused by the work of Murray, who injected subcutaneously a glycerine extract of the gland with surprisingly satisfactory results. Victor Horsley and others had previously practised transplantation of a thyroid gland, from a healthy sheep, into the tissues of a myxœdematous patient, and had, by that method, obtained distinctive relief to all the more prominent symptoms. Subsequently MacKenzie discovered that the internal administration of the gland by the mouth yielded quite as good results as the hypodermic method of Murray. At first, the fresh gland was administered, minced, and spread between bread and butter, in quantities which were regulated according to the urgency of the symptoms and the effect produced. Subsequently tabloids were prepared by the manufacturing chemists, containing each five grains of either the crushed gland or its extracts, and these have proved so efficacious and so much more convenient than the gland in its fresh state that they are now almost exclusively used. To begin with two tabloids should be given daily, but this number may be increased to three or four, as soon as it is evident that the patient can tolerate that amount. When taken in excess, thyroid extract is apt to produce headache, palpitation, shortness of breath, and pyrexia. It is a good rule for general guidance that, if the pulse becomes quickened to a hundred or more, a reduction in the dose is necessary. It must be remembered that, in treatment of this kind, all that is accomplished is the artificial supply, to the

economy, of a necessary element for proper metabolism, which is withheld by the absence, or disorganisation, of the thyroid gland. The abnormal gland itself is not restored, so that if a myxœdematous person is to remain in good health, she must, for the rest of her life, continue to take some preparation or other of thyroid gland in suitable doses. The quantity required will vary with the exigencies of each case. When the disease is fully developed, full doses will be required, for two or three months, in order to restore the tissues to their normal condition, but thereafter only such a daily amount will be necessary, as is approximately equivalent to the amount of secretion of a healthy gland. As a rule, one or two tabloids is enough, or, if the fresh gland from the sheep is preferred, about one quarter of a lobe will suffice. If the treatment is intermitted for any length of time, there will certainly be a recurrence of myxœdematous symptoms. In the case of children, the earlier the treatment is adopted the better is the prospect of achieving normal development, and of minimising the risk of permanent intellectual impairment. The dose must be graduated to suit the child's age, but, even in a baby, it may be commenced at one or two grains, and cautiously increased.

Myxœdematous patients should be warmly clothed, and, when possible, should seek a genial and sunny climate during winter. Repeated hot baths with subsequent gentle massage assists the disappearance of the subcutaneous œdema.

The accompanying anæmia frequently demands the administration of arsenic and iron, and the general health must be maintained by a careful dietary, regulation of the bowels, and suitable exercise in the open air. In those very rare cases, in which thyroid treatment persistently upsets the patient, trial may be given to pilocarpine, administered hypodermically in doses of from an eighth to a quarter of one grain.



PULMONARY EMBOLISM AND THROMBOSIS AFTER LAPAROTOMY.¹

By LEONARD A. BIDWELL, F.R.C.S.,

Surgeon to the West London Hospital, and Dean of the Postgraduate College.

THE history of a case, which was recently in one of my wards, will serve as an introduction to this subject.

Case 1.—L. C., an unmarried woman, aged 56 years, was admitted into the Hospital on August 15th, 1908. She had suffered from two attacks of appendicitis, the first of which occurred in October 1907, and the second in July last; from this she was only just convalescent. On admission her temperature was 99·2°, her pulse 96, and there was some tenderness and rigidity in the right iliac fossa. There was no sign of abscess or peritonitis. The temperature became normal on the day following admission and, after careful preparation, the patient was given chloroform on August 19th, when I opened the abdomen, finding an appendix which had perforated at its tip and which contained a concretion. The appendix was removed without any difficulty, and there was no rough handling of structures of the abdominal wall. The wound was completely closed and healed quickly, the stitches being removed on the ninth day. The temperature once rose to 99·6° on the day after the operation, but after then remained normal to the end. At my visit on August 27th, the patient was sitting up in bed and expressed herself as being quite well. On August 28th, at 4.20 p.m., she complained of feeling faint, and, at 4.35 p.m. she was suddenly seized with acute pain in the right side of the chest, gasped for breath, became cyanosed, and while trying to show the sister the situation of the pain, she became unconscious, and died. Ether and strychnine were injected, oxygen was administered, and artificial respiration practised, but without effect. Permission for an autopsy could not be obtained.

Such is the brief history of an unexpected disaster after a simple case of appendicectomy, and it impresses upon us the fact that even the simplest laparotomy is not entirely devoid of risk.

Now, although no autopsy was allowed, there is little doubt that the cause of death was pulmonary embolism or thrombosis. This condition, fortunately, is comparatively rare (in my practice it has occurred in about 0·5 per cent. of abdominal operations). It is unpreventable, since the active cause, as well as the means of prevention, are not known.

Since an embolism cannot occur without a previous thrombosis, consideration of the subject would not be complete

¹ A Clinical Lecture delivered at the West London Postgraduate College.

without reference to the physiology of thrombosis. Now, normal blood does not coagulate in normal blood vessels, and thrombosis only occurs in consequence of changes in the blood vessels, in the blood, or in both. A thrombus, of course, is formed by the development of fibrin; but fibrin does not exist in healthy blood, but is produced by the action of fibrin ferment on fibrinogen. Fibrin ferment does not exist in the blood, but is the result of the combination of calcium salts with nucleo-proteid. Calcium salts are normal constituents of the blood, but nucleo-proteid is not, and it is probably produced by degeneration of leucocytes and of blood platelets. In normal circumstances a considerable quantity of nucleo-proteid can be disposed of in the circulation, probably by the action of the endothelial lining of the blood vessels; this power is, however, diminished by injury, by inflammation, and by retarding of the blood stream.

Therefore we expect a thrombosis to form when the walls of a blood vessel have been injured, and the blood stream has been retarded, since, in these circumstances, nucleo-proteid will be developed, and the blood will have lost its power of absorbing it. The formation of a thrombus is also favoured by sepsis, by increase of CO_2 in the blood, by general conditions such as chlorosis and anæmia, and lastly by specific fevers, more especially typhoid. With regard to the thrombosis occurring after typhoid fever, Wright has shown that the blood of patients, convalescing from typhoid fever, contains a large excess of calcium salts, and, by neutralising the calcium salts in such blood, its coagulability is diminished. He further suggests that the excess of calcium salts in the blood is due to milk diet, since ordinary milk contains 1 in 600 of calcium salts; so he maintains that the particular liability to thrombosis during and after typhoid fever is due to feeding patients on milk for a long time, and that the liability can be counteracted by adding citrates to the milk. The coagulability of the blood is also increased by restricting the amount of fluids and by giving carbonate of magnesia. The tendency to coagulation is decreased by oxygen, by improving the force of the circulation, by alcohol, by excess of fluids and reduction of solids, by citric acid, rhubarb, acid fruits and wines, and by tobacco.

Thrombosis has usually been studied in those cases, in which one or both femoral veins become affected; these cases

are not uncommon after parturition (white leg), and also after typhoid fever. I have had three such cases recently. One occurred in a case of duodenal ulcer, which was under medical treatment, and was taking an exclusively milk diet. Here we had anæmia and excess of calcium salts as the cause. Subsequently the patient had a gastro-enterostomy done, and had no return of the thrombosis. The next case was one of ruptured gastric ulcer; the patient made a good recovery after the operation, but thrombosis of the left femoral vein occurred on the tenth day; the recovery was eventually complete. The last case was one of operation for abscess in connection with the appendix, where a thrombosis also formed in the left femoral vein.

When thrombosis attacks a femoral vein, the left is most usually selected, and this is explained by the course of the left iliac vein being less direct than that of the right, and also by the fact that the flow of blood through it, is likely to be retarded by the pressure of a loaded sigmoid.

Some surgeons assert that all cases of thrombosis are really septic in origin, but it is difficult to agree with this statement, since it occurs in aseptic cases, and in such a case as a gastric ulcer. Others maintain that post-operative thrombosis is caused by the pressure of retractors on the edges of the abdominal wound, causing injury to the deep epigastric veins; the thrombosis forms first at the seat of injury, and afterwards spreads down to, or round to the femoral vein.

Thrombosis rarely occurs till one week after an operation; from the 10th to the 14th day is the usual time, but sometimes it is as late as one month. Recovery is generally complete in from two to three weeks. As a rule, these cases do not suffer from any pulmonary complications, and in those rare cases, in which sudden death does occur after a femoral thrombosis, it is probable that a thrombosis co-existed in the pulmonary artery. To prevent femoral thrombosis after an operation, we should avoid the risk of injury to the edges of the wound, by placing gauze pads beneath our retractors, and by using them as gently as possible; we should avoid an exclusive milk diet; we should keep the lower bowel unloaded, so as to minimise the interference with the blood stream through the common iliac vein by pressure from the sigmoid; we should give excess of fluids, especially by the

rectum, and we should avoid calcium salts and carbonate of magnesia. The patient should have plenty of fresh air, and should be given citrates, if milk is allowed.

We now come to a consideration of the class of case with which I opened this lecture ; such a case is usually considered as one of pulmonary embolism, but on reflection, it is difficult to imagine how a clot of sufficient size to suddenly and completely overload the whole or even one branch of the pulmonary artery can be detached from a small peripheral vein.

Many years ago, the late Dr. Playfair, in discussing the cause of sudden death after parturition, maintained that most cases of so-called pulmonary embolism were in reality cases of thrombosis in the pulmonary artery, or even in the right ventricle. He stated that cases presenting symptoms of pulmonary embolism before the 13th day were always cases of pulmonary thrombosis, and that only cases occurring after a longer interval could be regarded as caused by embolism. More recently Box, after making careful autopsies of several cases of so-called pulmonary embolism, has come to the conclusion that these cases are a combination of thrombosis with embolism. He considers that a clot first forms in the pulmonary artery, or in the right side of the heart, and some sudden movement causes detachment of this clot, which enters and completely plugs one or both of the pulmonary arteries. This certainly seems the probable explanation. The clinical features of this condition are usually distinct. The patient, who has been progressing favourably after an uncomplicated operation, is suddenly seized with acute pain in the right side of the chest, this is followed by a very rapid and irregular action of the heart, considerable dyspnoea and cyanosis. Death sometimes occurs within a few minutes, but the patient may survive for several hours. I have looked up all the cases which have occurred in my practice ; they number eight, of which six occurred after laparotomies. The following are brief notes of the cases:—

Case 2.—A married lady, aged 35 years, consulted me on account of adhesions caused by attacks of appendicitis, and by a previous laparotomy for ovarian disease. I removed the appendix, and divided the adhesions, under ether, on March 13, 1905. She appeared to be quite well on the following day, and her temperature was normal. At 10 a.m., on March 15, she was seized with acute pain in the right side of the chest, she became

cyanosed, her pulse was rapid and irregular, and she had great dyspnœa. She was given oxygen, saline infusions, and strychnine, but her condition remained unaltered, and she died at 7.30 p.m., retaining consciousness till the end. At the autopsy, the right pulmonary artery was found to be the seat of embolism.

Case 3.—A strong working man, aged 41 years, was admitted into the Blackheath and Charlton Cottage Hospital, suffering from acute intestinal obstruction. I opened the abdomen, under chloroform, on March 18, 1905, and found that the obstruction was caused by a band, which I divided. The following day he appeared quite convalescent, and his progress was uneventful till March 21. At 9 p.m. on that day, he was seized with acute pain in the right side of the chest, and had great dyspnœa; his pulse became rapid and irregular, and he became unconscious and cyanosed. He died within a few minutes. At the autopsy, the right pulmonary artery was found to be the seat of embolism.

Case 4.—A man, aged 58, was admitted into the Blackheath and Charlton Cottage Hospital, for fracture of his left femur, on April 17, 1905. The limb was put up in splints with extension, without any anæsthetic. He was quite comfortable, and seemed quite well till April 20, at 10.40 p.m., when he became cyanosed, his pulse was imperceptible, and he became unconscious, and died in twenty minutes. He did not complain of any pain. At the autopsy an embolus was found in the right pulmonary artery.

Case 5.—A man, aged 60, was admitted into the West London Hospital suffering from carcinoma of the right submaxillary gland. I removed the submaxillary gland and adjacent lymphatic glands on February 25, 1907. The wound healed, with the exception of a small sinus; the temperature had been normal till March 3rd, when it rose to 100° ; two days later the patient complained of difficulty in breathing, but nothing abnormal was detected on examination of his chest. On March 6th, he felt much better till 11.30 p.m., when he was seized with intense dyspnœa, his respirations became very rapid, and his pulse rapid, irregular, and almost imperceptible. He did not complain of any pain, but became unconscious, and died at 2 a.m. ($2\frac{1}{2}$ hours after the seizure). No autopsy was allowed.

Case 6.—An unmarried female, aged 34 years, was admitted into the Blackheath and Charlton Cottage Hospital suffering from repeated attacks of appendicitis. She had just recovered from an attack, and there was some thickening about the cæcum. I opened the abdomen under chloroform and ether, on February 12, 1908, and I found that the appendix was perforated and surrounded by a small abscess; the appendix was removed, and the abscess thoroughly cleaned out, the temperature was normal on the day following the operation, but it rose to 103° on February 15th. In the afternoon of that day, the patient was suddenly seized with severe pain in the right side of the chest, she had urgent dyspnœa and became cyanosed; her pulse was 160, irregular and feeble. Oxygen and strychnine were given, but the patient died 15 hours after the seizure.

No autopsy was allowed.

Case 7.—A man, aged 52 years, was admitted into the Blackheath and Charlton Cottage Hospital on account of extreme dilatation of his stomach. There was a well-marked history of gastric ulcer. I performed a posterior gastro-enterostomy, under ether anæsthesia, on June 22, 1908.

The operation was very simple, and did not take long. The patient was rather blue for a short time after the operation, but, on the following day, he expressed himself as feeling quite well, and his temperature was normal. At 6 p.m. on June 23rd, he was seized with acute pain in the right side of the chest, his pulse became rapid and irregular, and he had urgent dyspnoea. Oxygen and strychnine were administered, but he died at 3.35 a.m. on June 24, $9\frac{1}{2}$ hours after the seizure.

At the autopsy an embolus was found in the right pulmonary artery, and the abdominal condition was quite satisfactory.

Case 8.—A gentleman, aged 60 years, gave a history of several attacks of phlebitis from varicose veins; four days before I saw him, he had signs of dulness and crepitation at the base of the right lung. For ten days he had suffered from abdominal pain, persistent vomiting, and diarrhoea, together with abdominal distension. As his symptoms were urgent, the abdomen was opened and the gall bladder found to be tensely distended, the adjacent coils of intestine were congested, and the head of the pancreas considerably enlarged. Although no fat necrosis was seen, the case was considered to be one of subacute pancreatitis, and a cholecystotomy was performed. The patient stood the operation well, and completely recovered from the anæsthetic. About an hour after the operation, while talking to his doctor, he complained of a sudden pain in the right side of the chest, his pulse became rapid and irregular, he became cyanosed, and died within half an hour.

No autopsy was allowed.

In these cases, with almost identical histories, the cause of death was verified by post-mortem examination in four cases, and there can be little doubt that death was due to a similar cause in the remaining four cases. I have found great difficulty in obtaining permission for an autopsy in these cases, since the sudden and unexpected fatal termination is so peculiarly distressing to the friends.

In these eight cases, the seizure took place, on the first day in one case, on the second day in one case, on the third day in one case, on the fourth day in three cases, and on the ninth day in two cases. The patient survived the seizure for less than half an hour in three cases, for two and a half hours in two cases, for nine hours in two cases, and for 15 hours in one case.

It is to be noted that in all the cases in which an autopsy was made, the clot was found in the right pulmonary artery; this is explained by the fact that the right pulmonary artery is in a direct line with the main pulmonary artery.

My idea of the sequence of events in these cases is that, owing to one or more of the previously mentioned cases of thrombosis, a clot forms in the pulmonary artery, or in the

right ventricle, very soon after the operation ; this may become absorbed without producing any symptoms, but it may increase in size, become detached, and then plug the pulmonary artery with the effect just related.

The anæsthetic given apparently has no influence. Chloroform was given in four cases, ether in two, chloroform and ether in one, and no anæsthetic in one case.

With regard to predisposing causes in my cases : in two or the appendicectomy cases sepsis must be allowed, as there was an intra-abdominal abscess at the time of the operation ; the case of carcinoma of the submaxillary gland was also septic, but the other cases showed no evidence of sepsis, either at the time of the operation or afterwards.

The risk of death from pulmonary thrombosis, after an appendicectomy in the quiet stage, is not merely a nominal one, since three such cases have occurred in my practice, and represent a mortality of nearly 1 per cent. after the operation, the death-rate from other causes being only $\cdot 4$ per cent. This risk emphasises the importance of giving a somewhat guarded prognosis even in the simplest case.

It is generally supposed that patients, suffering from uterine fibroids, are peculiarly liable to thrombosis and to embolism ; this is explained (1) by the increase of calcium salts in the blood as shown by the tendency to calcareous degeneration of fibromata, and (2) by some degeneration and weakening of the cardiac muscle fibre which is commonly associated with the condition.

In a recent issue of the *British Medical Journal*, Mr. Bland Sutton referred to the occurrence of pulmonary embolism after abdominal hysterectomy, and stated that it was due to sepsis, and that its occurrence would be prevented by the use of rubber gloves by the surgeon and his assistants. In a correspondence which followed this paper, Dr. W. Duncan urged that the liability to embolism was due to the anæmia, which so frequently affects women suffering from uterine fibroids, and, in support of his view, quoted a case of a woman suffering from uterine fibroids, who died from pulmonary embolism, while in the hospital awaiting operation.

I may mention that rubber gloves were worn by myself and by my assistant in the last four cases.

Finally, I think that the occurrence of pulmonary embolism, after abdominal operations, may be more frequent than is generally supposed, and that its apparent rarity may be due to the surgeon's natural dislike to attract attention to his fatal cases.

With regard to treatment, little can be done when the whole of the right pulmonary artery is blocked; oxygen, strychnine, and saline injections are always given, and in one case life was prolonged for 15 hours. Methods of prevention are, however, of more importance, and these include the treatment of anæmia before operation; giving excess of fluids, the use of citrates, and getting the patient up as soon as possible after an operation. At the same time lime salts, magnesium carbonate, and milk should be avoided.

I will now draw attention to a less serious form of pulmonary thrombosis, and one with which most surgeons are familiar, namely, the lodgment of a small embolus in a terminal branch of the right pulmonary artery leading to an infarct in the lung.

This condition is seen from time to time after normal parturition, and is also an occasional complication of an abdominal operation. It usually occurs between the 12th and 14th day, and its onset is sudden. The patient, who is practically convalescent, complains of severe pain in the chest, nearly always on the right side, the temperature is slightly raised, the breathing is quick, the pulse is always rapid, and there may be some slight cyanosis. The pain suggests pleurisy, but usually no friction is heard. After 24 hours, some friction sounds or signs of consolidation of lung may be found, and sometimes there may be signs of a little fluid in the pleural cavity. After this some blood-stained sputum is brought up, the pain subsides, and the attack passes off very quickly. The prognosis, as a rule, is quite favourable, and there does not appear to be any special danger of a larger clot being detached, and then producing the more severe form of pulmonary embolism. So little do I fear this complication that I am in the habit of getting these patients up as soon as the acute symptoms subside, on the idea that getting up increases the heart's action, and so diminishes the risk of thrombosis in the pulmonary artery.

The following are a few instances of this condition following operations on the appendix :—

Case 1.—A gentleman, aged 28 years, had suffered from repeated attacks of appendicitis. I operated on March 8th, 1904, and removed a greatly enlarged appendix, containing two hard concretions. The operation was very simple, and there was no damage done to the abdominal parietes. The convalescence was normal for the first 12 days, and the wound had healed. On the 13th day he was seized with a sharp pain in the right side of the chest, the temperature rose to 100° , the pulse was 100, and the breathing somewhat disturbed. The pain continued for the next day, and some signs of consolidation were found at the right base. On the third day he brought up some blood-stained sputum, the pain ceased, and convalescence was complete in a few days.

Case 2.—A little girl, aged 8, was just convalescent from an acute attack of appendicitis, when I operated on July 6th, 1908. I found that the appendix had perforated, the perforation being closed by adhesions. The appendix was removed. The temperature remained normal for the first two days, but, on July 8th, the patient suddenly became cyanosed, the temperature rose to 101° , the pulse became feeble and irregular, but she had no pain. On July 9th, crepitation and signs of consolidation were found at the base of the right lung. On July 10th, she coughed up some rusty sputum; on July 11th, the temperature was normal, and the lung had cleared up. The convalescence was complete.

Case 3.—A married lady, aged 46 years, had suffered from several attacks of appendicitis. I removed a kinked and adherent appendix on July 7th, 1908. The operation was very simple, the case ran a normal course, and the wound healed. On July 18th, she complained of severe pain in the right side of the chest, shortness of breath, and pain on breathing. The temperature rose to 102° , and the pulse to 116, there were no abnormal physical signs in the chest. On July 19th, some friction sounds were heard at the right base, and some rusty sputum was coughed up. On July 21st, as the dulness continued, an exploring needle was introduced, and about a drachm of clear fluid was drawn off. After this the temperature fell, and the physical signs cleared up, some more rusty sputum was coughed up, the pain ceased, and convalescence was rapid and complete.

Case 4.—A gentleman, aged 45 years, had suffered from several attacks of appendicitis, the last having occurred three weeks before I operated. I removed a kinked and adherent appendix on September 14th, 1908; the operation was performed with great ease, and there was no bruising of the parietes. The temperature kept normal after the operation, and convalescence was quite normal, except for some pain in the wound, on account of which it was dressed on the fifth day. The wound healed perfectly, and the patient was doing well till September 27th, when he complained of severe pain in the right side of the chest, his face became rather dusky, the pulse was rapid, and the temperature rose to 101° . No abnormal physical signs were detected. On September 28th, some blood-stained sputum was coughed up, and some dulness and friction sounds were found at the right base; the pain soon passed off and the physical signs cleared up, the patient got up within five days, and his convalescence was complete.

With regard to the cause of these emboli, in only one case was there any suspicion of sepsis, the other three cases being clean cases without the least question of any septic infection. All the operations, too, were very easy ones, and, in no case, was there any rough handling of the edges of the wound.

With regard to diagnosis, the main points are the sudden onset of pain in the right side of the chest, the elevation of the temperature, the unusual rate of the pulse and of the respirations, and the dyspnœa ; the chief signs, however, are the presence of blood in the sputum within the course of a day or so, and the rapid clearing up of the physical signs.

I am inclined to suggest that, excluding cases of oral sepsis, most of the cases of supposed pleurisy and pneumonia, occurring within one and three weeks after a laparotomy, are probably embolic in origin. With regard to treatment, we should remember the conditions favouring thrombosis, and so give plenty of fluids, and avoid milk, calcium salts, and carbonate of magnesia. Aspirin will usually relieve the pain, but morphia may be necessary, and there is no contra-indication to its use, stimulants are indicated, and, if the breathing is seriously embarrassed, oxygen is advisable. The patient should be kept quiet for the first 24 hours, but after this he should sit up in bed and be allowed to get up as soon as the pain has passed off, and the temperature has become normal.

I have never seen a fatal thrombosis or embolism occur after one of these mild seizures, so the prognosis, in my opinion, is quite favourable.



ORTHOPÆDIC SURGERY.

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CERVICAL RIBS.—Several articles on this interesting subject have appeared lately. J. B. Murphy (*Surgery, Gynecology, and Obstetrics*, October 1906) is in accord with the general experience of surgeons that most cases of cervical ribs do not give rise to symptoms, but when such arise they are usually serious. The principal symptoms are vascular and nervous. As a rule, it is the artery and not the vein which is involved. Sometimes ischæmia of the arm is produced, and this may or may not progress to gangrene.

W. Broadbent (*B. M. J.*, May 5, 1906) reports a case in which the prominent symptom was a very marked pulsation suggesting aneurysm just above the sternum. Systolic murmurs, which seemed to be caused by the sharp bend which the subclavian arteries took over the ribs, were present. There had been no pain in the arm or neck, and there was no evidence of nerve pressure. Deep palpation was necessary to trace the outline of the ribs, so that, if the patient had been elderly and fat-necked, a correct diagnosis would have been difficult. The nerve changes are usually sensory. There is no doubt that radiography is a most valuable aid in diagnosis, so that Murphy divides the surgery of cervical ribs into the pre- and post-Röntgen-ray periods. The value of X-rays consists in the possibility of diagnosing the presence of these abnormal structures before aneurysm and other serious symptoms are set up. Keene (*Amer. Jour. of Med. Sciences*, February 1907) goes into the subject most fully. He carefully describes the anatomy, and groups the symptoms under four headings:—Nervous, vascular, muscular and local in the neck. To these might have been added the association of cervical ribs with congenital scoliosis. Keene reviews the subject in general and carefully analyses 42 operative cases, and, as the article closes with a very full bibliography, it must be recognised as a classic work upon the subject. Several additional cases have been recorded. Kokol (*Centralb. f. Chir. u. Mechan. Orth.*) describes the case of a girl, aged about sixteen years, who

presented a small tumour above the left clavicle, with pain in the shoulder and a feeling of weakness in the arm. The diagnosis was verified by X-rays, and, as the symptoms increased, the rib was excised through an incision extending from the posterior border of the left sterno-mastoid downward to the clavicle and outward along it. C. K. Russell (*N. Y. Med. Record*, February 16, 1907) records three bilateral cases, the first two being in a sister and a brother. In the first case, a female, aged 27, there were pain and cramp in the right hand and arm, wasting of the thumb muscles, and general weakness of the right hand. The symptoms had persisted for six years, and excision of the abnormal ribs relieved them. The second case, a male, aged 35, a brother of the first, complained of inability to use the right arm properly, and of paræsthesiæ in the hand and forearm. Nine years before, a difficulty in writing had led to a diagnosis of writers' cramp, so that he had learned to write with the left hand. A third case, a female aged 24, had pain in the shoulder after a fall. The pain ran down the inside of the arm to the hand, the fingers and wrist were cramped and flexed, and there was wasting of the small thumb muscles. A fourth case is reported by Russell, in which there was more or less complete occlusion of the subclavian artery. A female, aged 31, had numbness in the fingers of the right hand, accompanied by alternate blueness and whiteness, and by numbness of the left index finger. After using a carbolic acid solution, the tips of the right third and fourth fingers became gangrenous, and eventually amputation of the arm was necessary. The patient committed suicide later, and Russell made a dissection of the neck, but even then was undecided as to whether there was present a cervical rib, or an undeveloped first thoracic rib.

C. F. Farr (*Amer. Med.*, May 1907) describes a bilateral case occurring in a female, aged 31, and figures a radiograph of the case. A female, aged 31, had noticed numbness in the arm since she was 18 years of age, and the symptoms had been more pronounced of late. The right arm was affected, but not so markedly as the left. The symptoms complained of were numbness, tingling, and severe aching. The arms and hands were never cold, cyanosed, or swollen, and the patient had not had any neuralgic pains in the arms.

Von Rutkowski (*Zeitschr. f. Klin. Med.*, LX., Nos. 3 and 4) reports a case of bilateral cervico-brachial neuralgia in a man,

aged 60 years, which was shown by the X-rays to be due to cervical ribs. The neuralgia had appeared first when he was 59 years of age, and was apparently traceable to the settling down of the trunk, from senile kyphosis. Treatment, by extension of the kyphosis, relieved all the symptoms, so that no operation was necessary. The diagnosis of the condition was made by careful observation of the symptoms, and by thorough palpation of the root of the neck, and was confirmed by X-rays.

The treatment consists in removal of the rib or ribs, and it is essential that removal should not be sub-periosteal. Sometimes it happens that, on account of the thickness and size of the cervical rib, it is not only difficult but dangerous to attempt removal of the whole structure. It is occasionally so placed that damage will probably be done to the vessels, nerves, pleura, and on the left side to the thoracic duct. In a case presenting such difficulties, the writer contented himself with removing $1\frac{1}{4}$ inches of the abnormal rib, with its periosteum, exactly where the pressure on the artery occurred.

CERVICAL RIBS AND CONGENITAL SCOLIOSIS.—These conditions are often combined. Krause (*Fortschritt a. d. Geb. d. Röntgenstrahlen*, Band X., Heft 6) reports numerous cases of this affection, and draws the following conclusions:—"Among a large number of scoliotic patients, cases are occasionally found characterised by a peculiarly high location of the curve, which is rigid and limited to a few vertebræ, usually to the last cervical and first dorsal. In such cases, a cervical rib is not unusual, and they frequently present complicated developmental anomalies of the vertebræ and ribs. Supernumerary rudimentary ribs are seen at the junction of the cervical and dorsal segments. There also occur fusion and bony union between neighbouring vertebræ, and failure of bony union between the laminæ of a vertebral arch, or cleavage of the vertebral arch and body. Supernumerary ribs arise from the above-mentioned wedge-shaped rudimentary vertebræ. Cases are also seen in which neighbouring ribs arise from a common point, and then bifurcate, Krause regards both anomalies, scoliosis, and supernumerary ribs, as congenital.

Drehmann (*Zeitschr. f. Orth. Chir.*, Band XVI., Heft 1 and 2) gives a detailed report of seven cases, with diagrams and radiographs. He found the same appearances in the ribs and spine as Krause, and divides the cases into two groups with transi-

tional forms. The first group includes those cases in which, in addition to the supernumerary dorsal rib, there is an associated rudimentary vertebra. The second group comprises those cases in which there is a true cervical rib with a rudimentary vertebra. He thinks that, so far as treatment is concerned, we are practically powerless, but the writer begs to differ from him on this point. In two cases, which he has been called upon to treat, considerable improvement in the outline of the spine has been obtained by extension and active and passive exercises.

ARTHRITIS DEFORMANS.—A preliminary report, on the relation of albuminous putrefaction of the intestines to arthritis deformans (Rheumatoid arthritis, Osteo-arthritis), and its influence upon treatment, is furnished by C. R. Andrews and Michael Hoke (*Amer. Jour. of Orth. Surgery*, July 1907, p. 61). They give details of five cases, and they draw their conclusions therefrom. They remark that there are three types of chronic excessive intestinal putrefaction :—(1) The indolic type, occurring in the small as well as in the large intestine. In this type large quantities of indol are produced, and the stool is usually alkaline. The bacillus coli probably plays the most important rôle in this type. (2) The saccharo-butyric type, occurring in the lower ileum and large intestine, and produced, for the most part, by the anaërobic and butyric acid-forming bacteria. In this type, the indol is slightly, if at all, in excess, and the stool may be acid. (3) The combined indolic and saccharo-butyric types. According to Herter, the biological characters of the micro-organisms, inhabiting the intestinal tract, are not the same at all ages, and in this may be found a cause for the different types of decomposition in the intestinal tract. The number of bacteria is, however, affected by other influences, especially by the increase and decrease in the amount of albuminous food taken. The indication, therefore, is to decrease the amount of albuminous food, or to introduce it in such a form as to prevent putrefaction. The authors do not necessarily think that proteid decomposition always manifests itself as a form of so-called rheumatism, but they have found that in the cases cited above, suffering from rheumatoid arthritis, albuminous putrefaction in the intestine existed ; and from the remarkable improvement, which followed the correction of this process, it seemed reasonable to infer that a causal relationship exists. The treatment consisted in putting the patient upon fermented milk, the fermen-

tation being produced by the action of the bacillus lacticus and brewers' yeast on cows' milk. The lactic acid increases the acid of the stools, and this prevents putrefaction. Before the patients were put upon this milk diet the stools were alkaline.

The authors have come to the following conclusions:—

(1) It is plain that the term arthritis deformans, or metabolic arthritis, may be accurately applied to include all the phases of what seems to be the same condition, presenting varying manifestations in different joints of the same individual, and in similar joints of different individuals. (2) The constant finding of evidences of albuminous putrefaction in the intestine, in connection with the cases investigated, leads us to believe that this metabolic form of arthritis is directly traceable to albuminous putrefaction. (3) The uniform improvement of the symptoms, however varied they may have been, the invariable disappearance of all the soft tissue-thickening around the joint when these patients have been put on a fermented milk diet, demonstrates beyond the shadow of a doubt that it is *par excellence* the food for these patients. (4) That the stools and the urine on a fermented milk diet may still show evidences of albuminous putrefaction, and yet the toxic effects may lessen and disappear. (5) A certain amount of daily out-door exercise is necessary; and, when it cannot be taken, massage is of great importance. It is essential that the sleeping rooms should be airy, and the skin must be kept active. (6) In a very large number of cases, in which serious joint changes have taken place, relief is impossible without an appropriate combination of surgical operation, treatment with apparatus, and the general medical and dietetic measures spoken of above.

In connection with the treatment of chronic arthritis, we commend to the notice of readers an article on the "Place of Operative Surgery in the Treatment of Chronic Arthritis," by Charles F. Painter (*Amer. Jour. of Orth. Surgery*, April 1908, p. 413). He discusses treatment by open incision and aspiration, by careful correction of the deformity, and by passive and active manipulations, and says that a good degree of functional activity in the affected joint can be secured by these measures, and a case otherwise doomed to be a cripple may be saved from that fate, and transformed into a relatively useful member of society.

TYPHOID SPINE.—T. Halsted Myers (*Amer. Jour. of Orth.*

Surgery, Vol. V., p. 180) writes on this subject with special reference to the deformity; and David Silver (*Ibid.*, p. 194) reports a case with radiographic evidence of structural change. He also analyses the reported cases, and gives a complete bibliography. The spinal lesion, according to Myers, consists of organic changes in the vertebræ. In some cases, the deformity consists of a distinct kyphosis; in others, of a thickening of the vertebræ due to deposit of new bone.

Silver figures the radiograph of a case, in which the process was limited to the first and second lumbar vertebræ on either side of the intervertebral disc, with a deposit of new bone between the transverse processes. In general, the affection is at first a periostitis, succeeded by softening of the adjacent compact and cancellous bone; with, in many cases, subsequent posterior projection of the spinous process.

As to the age, at which the affection appears, an analysis of 45 cases furnishes nothing distinctive; but with regard to sex, in 51 cases in which this was stated, 45, or about 90 per cent., were males, and only 6 were females. The time of onset of the spinal complication varies considerably. In 4 cases, it appeared during the progress of the fever; in 30, during immediate convalescence; in 14, within 1 month after convalescence; in 3, within 2 months; in 1, within 3 months; and in 1, within 4 months. Thus, in 48 out of 53 cases, or in 90 per cent., the onset occurred before the end of the first month following convalescence. Some rise of temperature occurred in 28 cases; in 5, this did not exceed 100° ; in 10, it was between 100° and 103° ; and in 13, it was above 103° . The pyrexia varied in duration from 2 days to 3 months, and all the severer cases had a rise of temperature at some time.

Pain.—Pain in the back is the most constant symptom of the affection. It is always increased by movement, is remarkable for its severity, and the majority of the patients are completely disabled. In most of the cases morphia was occasionally used for relief, and one patient had to be given chloroform on several occasions. The lumbar region is most frequently involved. In 14 cases a distinct swelling in the affected region on either side of the spine was noticed. This was associated with redness in 3, and with increased local temperature in 4 cases. Tenderness was noted in 29 cases, and spinal rigidity

was seen in 20. Kyphosis occurred in 15 cases out of 67, and scoliosis in 7 cases.

As to nerve changes, sensory changes were present in 12 cases, and these consisted of anæsthesia in 1, hyperæsthesia in 2, paræsthesia in 7, and hyperæsthesia and paræsthesia together in 2. Spasticity was noticed twice and ataxia once. Spasmodic contractions were seen in 11 cases. The knee jerks were increased in 19, diminished in 1, first increased and then absent in 1, and first decreased and then absent in 1. Ankle clonus was associated with an increased knee jerk in 6 cases. Babinski's phenomenon was not found in any case. The reaction of degeneration was present in one case, and incontinence was observed twice. The examination of the blood and the Widal test were carried out in 14 cases. The result was positive in 12 and negative in 2.

The duration of the disease varies, but in 39 cases it extended from one month to two and a half years, the average being about eight months.

From the observations which have been made it is evident that the affection may be a spondylitis or a peri-spondylitis, and that periostitis, chondritis, osteitis, and osteomyelitis occur. The inflammation is not limited to the outside of the spinal column, but it may affect the periosteum on the inner side of the spinal canal, as is well shown by several of the cases. In them the sensory and motor symptoms were such that they cannot be explained by pressure on the nerves at the point of exit from the foramina, but must have been due to pressure on the cord itself. It is interesting to note that in only one reported case did pus form. The treatment consists of recumbency, immobilisation, counter-irritation, and sedatives. As to counter-irritation, that given by the cautery is undoubtedly of considerable value.

Finally. Silver gives a very complete bibliography of the subject up to date.



RECENT WORK ON ANÆSTHETICS.

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THE question of fatalities during anæsthesia has been the subject of much discussion, both verbal and literary, during the past year. The matter was brought prominently to notice by a debate at a meeting of the Medicological Society, in which some surgeons and anæsthetists took part, in addition to physicians, coroners, and physiologists. We do not propose to review at all in detail the writings that have recently grown around this subject. For the most part they deal with that educational, and, so to speak, social, side of the matter which, though of great importance, is not suitable for discussion in this place. It may, however, be remarked with satisfaction that the view, undoubtedly correct, promulgated by Dr. F. W. Hewitt is surely gaining ground in the medical profession, as well as with the general public, that practical reforms are likely to follow upon a more enlightened opinion. This view, in the words of Dr. Hewitt, is that "before the strictly medical and scientific aspects of the problem of death-prevention [under anæsthetics] can be profitably discussed, the ground must be cleared by raising the level of this department of practice, and by recognising the all-important fact that it is only by equipping all medical practitioners with increased knowledge, and by applying it in practice, that deaths under anæsthetics may be prevented." In the article referred to, a scheme is outlined by which might be carried out the kind of reforms that many think necessary at the present time, if the death-rate of anæsthetics is to be kept to its inevitable minimum. Deaths are even now very few in proportion to the enormous number of administrations. They might, however, undoubtedly be rendered fewer still, if more regard were generally paid to the question of skilled anæsthetisation.

Quite recently the *Lancet* has printed a leading article upon "the professional status of anæsthetists," a subject

cognate to that to which we have just alluded. And it is interesting to observe, in American writings,¹⁴ an amount of dissatisfaction with the present arrangements as regards anæsthetics, both in and out of hospitals, that is very similar to that which is felt by many in this country, and which appears to rest upon a similar just foundation.

LUMBAR ANÆSTHESIA.

The latest development of anæsthetics, by intra-spinal injection, is closely connected with the question on which we have just touched, for it seems likely to be widely used only where the general anæsthesia that can be provided leaves the surgeon with anxiety as to the safety during operation, or the welfare, after it, of his patient. Thus, in many cases, the choice between an inhalation anæsthesia at the hands of an inexperienced man, and lumbar anæsthesia in the hands of an expert, would undoubtedly be properly decided in favour of the latter. When the choice is between the two methods in the hands of an expert in either case, the advantage, in most cases, seems to lie with the older method. Mr. Barker has continued, with a third series of 100 cases of lumbar anæsthesia, to publish his experiences and results with this method. Good as are his general results, yet it must be remembered that they are those of a surgeon who has rendered himself an expert in the matter, and that even then there is a number of failures which, if they occurred in a like proportion in the administrations of an anæsthetist, would stamp him as incompetent. Moreover, careful reading of Mr. Barker's articles leads me to the conclusion that he is more impressed with the possible dangers of the method than many who have tried it less often. At the same time, his final opinion of the question of general employment of the method is still *sub judice*, and may well be quoted here as coming from one who speaks with well-founded authority : "We may have a very valuable addition to surgery in this procedure which makes it worth cultivating, and to be hasty in judgment in either direction would be unwise at present. If the first mischances, met with in the earlier history of chloroform, had led to its being discarded, we should have been deprived of one of the greatest blessings to humanity ever discovered." Mr. Percy Dean,¹⁶ values the method particularly

for its efficiency in combating shock. It appears indeed that it is especially in such cases as, for instance, double amputations after accident that the field of highest advantage of this method will eventually be found. Mr. Dean laid stress also upon the beneficial effects which lumbar injection appeared to have in some cases of peritonitis, in combating the paralytic condition of intestine that so often complicates such cases. Recently Mr. Mill Renton¹⁷ has published a series of 50 cases with very good results, and Mr. McGavin is another surgeon who has been working at the matter with success. On the Continent, where lumbar anæsthesia has had a far wider trial than in this country, and where, if we may judge from what is written, there is greater cause for dissatisfaction with inhalation anæsthesia than in this country, there appear, from time to time, disheartening accounts amongst many that are favourable. The dark side of the picture is very strongly painted by Dr. P. Hardouin,¹⁹ who relates 16 fatal cases. It is only fair to state, however, that in several of them there seems to have been a disregard in the technique of those very points to a careful regard of which Barker and others attribute safety. Dr. A. Ach²⁰ details his experiences in a series of 450 cases. He recommends tropa-cocaine in small doses and weak solution, with an elevated position of head and shoulders, and never any elevation of the pelvis. He regards fever, sepsis, syphilis, central nervous diseases, and scoliosis, as contra-indications to the use of lumbar anæsthesia.

SCOPOLAMINE-MORPHINE NARCOSIS.

The advantage, in many cases, of a preliminary injection of morphia and hyoscine before anæsthesia has for some time been made use of by anæsthetists. The anæsthesia which may be obtained by these drugs alone, after repeated injections, has not, however, been tried to any great extent in this country. Professor Krönig of Freiburg²¹ has given an excellent description of the employment of this method in cases of labour, and believes that it is better adapted to the abolition of pain in confinement cases than in any other procedure. The physiological effects of hyoscine formed the subject of a study undertaken by Mr. Webster.²² He was particularly concerned to find whether anything was to be

hoped from this drug in the way of diminishing the chances of heart-failure during chloroform anæsthesia. He found that, although hyoscine and allied drugs have an effect in diminishing vagus inhibition, yet any advantage thus gained is more than counterbalanced by their depressing influence upon cardiac action. He states that they have a paralytic effect upon the heart, diminishing the output. Webster's conclusions are drawn from over 50 experiments.

DELAYED CHLOROFORM POISONING.

The condition, first distinctly brought to notice in this country by Dr. L. Guthrie, in 1894, and still unexplained, has been the subject of much recent theoretical writing, as well as the occasion for the publication of many cases, the symptoms of which present the clinical picture known as delayed chloroform poisoning. In such a case, the patient, usually a child, after apparently recovering from the effects of an anæsthetic, usually chloroform, is seized, after about 12 hours, with repeated vomiting, delirious excitement, sometimes jaundice, and finally coma, which ends in death. Acetone appears in the urine, and its smell in the breath. Post-mortem, a buffy-coloured liver, which is the seat of extensive fatty infiltration, is the principal abnormality. Although such a sequence of events, in connection with chloroform anæsthesia, appears to have been fairly often noted by Continental observers, Dr. Guthrie's cases were regarded, in this country, as being probably instances of septic carbolic-acid poisoning, pulmonary embolism, or septic infection. Since his first publication on the matter, however, many such cases have been related by other observers, and although anæsthetists of very wide experience have never met with such instances, there can be little doubt that deaths occasionally occur after chloroform anæsthesia in the manner described above. What is the explanation of such an occurrence? In the first place, it must be stated that the explanations mentioned above have been proved not to hold good in most of the later cases, including four published by Dr. Guthrie in 1903. Secondly, a very remarkable feature of these cases is that they appear to be as frequent in the case of short operations, where small amounts of anæsthetics have been inhaled, as in more serious procedures. So far as I am aware,

not one of these cases has occurred in the practice of any anæsthetist who habitually uses some ether, either separately or mixed with chloroform, in the course of his administrations. It must be admitted that, in cases hitherto published, details of the amount of chloroform offered for inhalation and of the strength of vapour inhaled have been very deficient, leaving it open to Col. Laurie (*B. M. J.*, March 30, 1907) to ask if the cases are not all instances of overdose.

It is difficult to understand, however, how an overdose, in the course of a short operation, could be inhaled without any immediate symptoms being invoked, and yet such serious consequences as those of "delayed chloroform poisoning" arise after the patient has temporarily recovered from the anæsthetic. At the present time, it cannot be stated with certainty that the symptoms are due to chloroform at all, and, for this reason, and because of the general presence in these cases of acid products of fat metabolism, the term acid intoxication is preferred by some.¹

In a leading article upon this subject, it remarked that the name "delayed chloroform poisoning" should be replaced by some phrase which does not commit us to a pathogenesis which is as yet not beyond question. Many factors are, according to this writer, at work. The influence of antiseptics, such as carbolic acid, of starvation, of fatty diet, such as cod-liver oil, of sepsis, and of fat embolus, he regards as negligible, the constant factors to be reckoned with being the anæsthetic, the operation, and the antecedent condition of the patient. The last, of course, may involve the question of the importance of some of those very conditions, starvation, fatty diet, etc., which were just previously ruled out of court.

Indeed, in one of the most recent contributions to this matter,² Dr. William Hunter believes that the withholding of food "for many hours before the administration," assists in the "further undue weakening of a liver already weakened by disease, or by poor nutrition." According to this writer, the vomiting which occurs after anæsthetics is not of nervous origin; it is toxæmic, due to the profound depression of liver function, with consequent diminution in its antitoxic function, during the period of the administration of the anæsthetic. A

natural corollary to Dr. Hunter's views is his recommendation that patients, before operation, should always have a "nutritious and easily digestible meal, well-sweetened, two or three hours before the operation." Unfortunately, in many cases, a patient, presumably from nervous causes, does not digest easily digestible food that he has taken so long as six hours before an operation, the failure of digestion being made obvious by the nature of the post-anæsthetic vomit.

A different suggestion for treatment in delayed chloroform poisoning comes from Dr. A. P. Beddard.⁴ This is that dextrose should be used, either by the mouth, or, failing that, by rectal infusion of solutions of 10-20 per cent. solution, or by intravenous infusion of 6 per cent. solution. Dr. Beddard remarks that, although patients suffering from this form of poisoning may recover, yet the prognosis is bad ; which is only another way of saying that the treatment, whether preventive or curative, is unsatisfactory. The clinical symptoms and the post-mortem appearances are constant ; it is their interpretation which is still open to controversy. The most generally accepted explanation of delayed chloroform poisoning, at the present time, is that it is an acid intoxication produced by the products of the incomplete destruction of fat. The theory supposes that the inhibition of metabolism by the anæsthetic results in incomplete fat combustion. Dr. Beddard holds that an acute acid intoxication of the body is not the cause of the symptoms or of the fatal result. His argument is that there are many conditions, in which metabolism is so deranged that organic acids produced in the body escape oxidation and are excreted in the urine, causing an acidosis, just as is the case in delayed chloroform poisoning. A high acidosis may exist for weeks or even for years without causing symptoms of acid intoxication ; in fact we do not know any condition, whose symptoms and fatal issue are probably due to acute acid intoxication, with the single exception of diabetic coma. The facts should be stated, according to Dr. Beddard, in this way :—Nitrogenous metabolism is increased, there is an increased breaking down of tissue proteids. But the metabolism of nitrogenous substances is also disturbed, so that products of proteid catabolism leave the body no longer in a fully oxidised state ; consequently the cells have lost, to a corresponding

degree, the power of obtaining energy from proteid. The hepatic glycogen rapidly disappears, and, to a less extent, that of the muscles and other cells; and, further, the total quantity of carbohydrate in the body is decreased. But, in poisoning by chloroform, the liver has not necessarily lost the power of forming glycogen, as can be shown by feeding animals with dextrose.

It is therefore clear that carbohydrate metabolism is increased greatly at first, and, since the store of carbohydrate material in the body is relatively very small, this increased utilisation must soon come to an end. The facts, in regard to the metabolism of fat, are well established. Microscopically the cells of the liver, muscles, and kidneys appear to be loaded with fat. In the case of the kidney, however, there is no actual increase of fat; the appearance of the cells is due to a change in their protoplasm, whereby fat in combination becomes obvious under the microscope. In the liver and muscles, there is an actual increase of fat, which has been transported from the normal sites of storage, and has been taken up by the cells of these tissues. A similar active transference of fat from the depôts to the hungry cells takes place in starvation, but, in this case, the cells of the liver and muscles do not become loaded with fat; and this must be because they can metabolise it more rapidly. In poisoning by chloroform, the cells are starving, and call for fat, which they take up more greedily than they can metabolise; hence, whilst the transference of fat about the body is increased, the metabolism of fat is decreased, and we observe under the microscope a fatty infiltration of degenerated products. Regarding these as the facts of the matter, Dr. Beddard further quotes Rosenfeld's interpretation of them. This is to the effect that when cells are poisoned by chloroform their metabolism is so altered that, whilst they can utilise carbohydrates well, they can oxidise proteids only imperfectly, and fats even less well. Consequently as soon as the cells have used up their store of carbohydrate, their hungry condition causes a breaking down of tissue proteid and a transference of fat to the cells; but, since neither of these foodstuffs, and especially the fat, is properly utilised, the cells remain in a condition of severe starvation, which may rapidly lead to their death through loss

of energy. If the poisoned animal is fed with dextrose, the transport of fat is prevented, because it is no longer necessary. Hence the deduction for practical purposes that we should try the use of dextrose in cases of "delayed chloroform poisoning." So far there has been no recorded case, of which I am aware, in which this suggested line of treatment has been acted upon.

At the recent meeting of the British Medical Association, the subject of fatty acid intoxication was discussed in the section of diseases of children.⁵

The part played by anæsthetics in production of fatty acid intoxication was considered by most of the speakers. Dr. Guthrie, who opened the discussion, holds the view which he originally expressed, that the symptoms in delayed chloroform poisoning are produced by the combination of a pre-existing superfatted condition of liver and the further perversion of metabolism and of reduction by the action of a general anæsthetic. Chloroform is by far the most dangerous anæsthetic in this respect. The previously existing fatty state of the liver may be due to one or more of many causes. Amongst these are excessive supply of fats and of carbohydrates in diet, inability to metabolise fat, or to make use of carbohydrates, glycogenic disorder, as, *e.g.*, perhaps, is the case in cyclical vomiting, in sepsis, acute or chronic, or the action of specific organisms: for example, in gastro-intestinal affections, in diphtheria, or pneumonia. The practical conclusions drawn by Dr. Guthrie were to the effect that in cases, in which there is reason to suspect the existence of fatty liver, and possible hepatic inadequacy to deal with fat and carbohydrates, ether with oxygen would probably be the least dangerous form of anæsthetic to use. In persons, who are the subject of cyclical vomiting, administration of anæsthetics would be particularly dangerous on the eve of such an attack, and least dangerous towards the end of an attack. Dr. G. I. Spriggs⁶ laid stress on the importance of the effect of vomiting itself. He was prone to attribute the vomiting to the anæsthetic, probably too freely administered, and subsequent troubles to the vomiting. Severe vomiting aggravates acidosis, disposes to acute degeneration of the liver, and leads to a serious loss of fluid from the body. In the case of children, Dr. Spriggs laid down the line of necessary

treatment as being the administration of fluid, alkali, and carbohydrate food. He suggested the washing out of the stomach, and injection into it of solution of sugar, in cases in which vomiting became severe after chloroform inhalation.

Mr. Stiles, of Edinburgh, in the course of the same discussion, remarked that, at present, the only solution of the difficult problem presented by cases of delayed chloroform poisoning was to substitute ether for chloroform in all septic cases, and in all cases in which the patient might be suffering from hepatic insufficiency. As showing the vague state of present knowledge in the matter, it is interesting to note that a speaker, Dr. Langmead, following soon after Mr. Stiles, declared chloroform to be by no means alone in producing the symptoms, and that, in addition to ether and ethyl chloride, a case had actually occurred after inhalation of nitrous oxide gas. Further, Dr. F. A. Bainbridge stated that, until observation had been made upon the alkalinity and the CO_2 contents of the blood in these cases, it was impossible to say whether there was or was not an acid intoxication present. Perhaps the most characteristic examples of the condition of delayed chloroform poisoning recently recorded are to be found in the accounts of three cases given by Mr. E. D. Telford. In conclusion of these remarks upon the subject, it may be stated that H. Gudgeon Wells⁷ considers a probable explanation of the condition to be that chloroform inhibits the oxidising enzymes of the liver cells without corresponding inhibition of the autolytic enzymes and the lipose of the cells.

CHLOROFORM.

The exact quantity of chloroform that is in circulation, during the presence of given degrees of anesthesia, has been the subject of an investigation carried out by Buckmaster and Gardner, and described by them before the Royal Society. They arrived at several important conclusions, some in harmony with, and others in disagreement from, previous observations upon chloroform in the blood. Buckmaster and Gardner determined the quantity of chloroform present in the blood of a cat at the time of the loss of its conjunctival reflex to be from 14 to 27.6 milligrams per 100 grams of

blood, which corresponds closely with the amounts determined by French observers. They fix the lethal amount at 40 milligrams per 100 grams of blood. These observers find that the chloroform in circulation is carried by the corpuscles, and that the plasma remains free, unless the anæsthetic is rapidly given, or is pushed to an extreme degree. They find that elimination is rapid and less variable than is absorption of the vapour, and that the greatest rate of absorption is within the first two minutes. They thus confirm the well-established clinical rule, to start with a very weak vapour, and only gradually to increase its strength. The two methods, by the way, in which this varying dosage of chloroform is commonly achieved are contrasted by a correspondent to the *Lancet*. A series of letters, à propos of death under anæsthetics, appeared in the columns of that journal during the year just past. In the letter to which we now refer, the writer states that, with a mask and drop bottle, the dosage is varied (1) by either keeping the mask at a uniform distance—generally a very short distance—or actually resting upon, the face, and varying the amount of chloroform that is sprinkled or poured upon it, and (2) by placing, at intervals, a uniform amount of chloroform—say half a drachm—upon the mask, and varying the distance at which this is held from the face, say from half an inch to two inches. The latter method, which he describes as the Edinburgh method, he considers the safer procedure, and it undoubtedly is so. For experiments, carried out by Symes in Waller's laboratory, several years ago, showed that, provided the air space—as would be obtained at a distance of half an inch from the face—is kept constant between the face and the mask, the latter may be very freely wetted with chloroform without risk of obtaining a vapour much above 2 per cent.; whereas, if the mask is allowed to rest upon the face, but small quantities of chloroform need be put upon it to raise the strength of the vapour inhaled to a dangerously high strength.

CHLOROFORM AND SHOCK.

The part which an anæsthetic may play in the prevention, or in the accentuation, of shock is a subject of much practical importance, and one which has recently attracted the attention

of workers in the physiological laboratory as well as of clinical observers. Roughly speaking, the traditional view of the matter may be stated thus: the lighter the anæsthetic, the greater the risk of shock, and the deeper the anæsthesia the less the shock. It is certain, both from experiment and more detailed clinical work, that such an expression does not convey the true facts of the case. Certainly, where chloroform is concerned, it has been incontrovertibly shown that a very deep anæsthesia, so far from preventing, materially aggravated surgical shock, a comparatively light stage of anæsthesia being much better suited for the avoidance of this condition in its worst form. This is easily understood, for we know that a marked lowering of the blood-pressure is an essential element both of surgical shock and of deep degrees of chloroform anæsthesia. In the former case, it appears to be brought about through exhaustion of the vasometer centre, in the latter, not only by affection of this centre, but by direct weakening of the muscular action of the heart. Of course, as has been well pointed¹ out by Mr. A. J. Walton, shock with all anæsthetics tends to be less than it would be without them, owing to the distinctly decreased influence of afferent impulses through the presence of unconsciousness. Not only are the higher centres of consciousness unable to appreciate trauma, but also lower reflex centres are not so markedly reflected. Moreover, the peripheral nerves themselves that convey the impulses are less able to so conduct stimuli during anæsthesia.

On the other hand, anæsthetics may themselves be toxic in their action on the higher centres, absorption of the anæsthetic thus tending to an early exhaustion of the centres. The different anæsthetics vary greatly in this respect. Thus ether tends to keep up blood pressure, and thus to diminish surgical shock. Chloroform, on the other hand, throughout an administration, tends to cause a lowering of the blood pressure, and thus adds an additional degree to any surgical shock that may be caused by the operation. Spinal anæsthesia is from this point of view admirable. It does not *per se* cause any fall in blood pressure, and operations, even in old and much exhausted subjects, were accompanied by remarkably little shock. This statement, however, ignores the not infrequent condition of

severe faintness and pallor that supervenes early in cases of spinal anæsthesia. Although, according to Barker, such a condition is of no importance, yet in the case of other surgeons¹⁰ it has precluded serious or even fatal consequences. Concerning the question of treating shock, Mr. Walton, in the paper referred to above,⁹ points out the correctness of what has already been shown by Crile and Lockhart Mummery with regard to the harmfulness of strychnine, brandy, ether, and other stimulants, when shock is at all severe. Such drugs are not only useless but may do much harm. It is in such slight cases of shock as would recover unaided that these bodies are of use. They have no effect upon the centre, where lies the true cause of the shock, nor upon the peripheral arterioles, merely stimulating the cardiac contractions. Drugs, such as supra-renal extracts and ergot, are more rational remedies. The former in weak solution (1-50,000 to 1-160,000), used as a continuous rectal irrigation at the rate of a pint an hour, is an effective means of combating post-anæsthetic shock. The limit of fluid thus to be infused is eight pints, and, when venous infusion is employed, not more than three pints are to be recommended.

ETHER BY THE OPEN METHOD.

The advantage of ether anæsthesia, in the matter of shock, has been just alluded to, and a few words may be here said of the particular advantages claimed for this anæsthetic when administered by the open method. Mr. B. Gardner¹¹ claims that the induction period is not unduly long, a common complaint raised against "open ether," and that there is less secretion of mucus, less liability to reflex movement, and a more comfortable recovery than from other methods. He believes that the method does not reduce the danger of acute bronchitis or pneumonia, and he admits that very large amounts of ether may have to be employed. The large proportion of this, which reaches the air of the operating theatre, and is breathed by all there, may, in operations of long duration, prove a very serious drawback to this method, at any rate, when the operating surgeon is at all keenly susceptible to the smell or the action of ether. It is no small counterfoil to the privilege of securing a patient, who

is not sick after operation, if at the same time you provide a surgeon and an assistant who are. In certain cases, however, particularly those where long rectal operations are concerned, open ether offers advantages that outweigh all other considerations. In rectal cases, moreover, the vapour is exhaled at a considerable distance from the surgeon. Of the great safety of the method, so far as the time of administration is concerned, there is, of course, no question, and it should, therefore, be used, whenever possible, in cases of desperate illness, or great feebleness or shock, in preference to any other inhalation.

STATUS LYMPHATICUS.

The condition known by this name, and characterised by the presence of an enlarged thymus, general enlargement of lymphatic tissues all over the body, and particularly of the follicles of the intestines, enlarged spleen, and an under-development of the aorta, has been frequently called to account for deaths occurring under anæsthesia. These cases have occurred almost invariably in connection with chloroform, or a mixture containing it. McCardie, who has collected 30 fatal cases, gives description of two in which only local anæsthetics were employed. The condition appears to be very difficult to recognise clinically, which makes it the more formidable as a cause of anæsthetic fatality. However, as there appears to be no authenticated case of a "lymphatic diathesis" death occurring under ether, and as the subjects of this disorder always had enlarged tonsils and adenoids, according to those who have written of the condition, it should not be impossible to avert catastrophe. Moreover, many of the reported cases are open to other interpretation than that they were due purely to the presence of status lymphaticus.

In some, untreated reflex respiratory shock during light anæsthesia, and in others, overdosage, offer themselves as very probable explanations. At the same time, the condition of "status lymphaticus" as a pathological entity is well established, not only by post-mortem examination of anæsthetic cases, but also by the examination of patients suddenly and unexpectedly dying after slight shocks or slight exertion, or from no ostensible cause. The condition must, therefore, be seriously reckoned with as a possible cause of anæsthetic

fatality, and close study of fatal cases, that have now recurred, should help in the future detection of subjects of the condition before an anæsthetic is administered. An injection of morphia beforehand, and the administration of ether, would probably then be the safest method to adopt. Some cases of this condition are to be found related in the *California State Journal of Medicine*, for August 1908, and a discussion on the subject, which repays the attention of the curious, if only for a remarkable "apologia" given in one case of death, viz., that it took place on the anniversary of the San Francisco earthquake! Moreover, it is stated to have "jarred the nerves" of the operator as much as did that terrible phenomenon, of which also he had been a witness.

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THE ACTION OF DRUGS ON DISEASES CAUSED BY PROTOZOA.

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THE discovery of the bacterial origin of infectious diseases naturally gave rise to great hopes of specific treatment through the agency of drugs; it was believed that certain of the disinfectants would be found to kill disease organisms without affecting the host. This expectation has not been realised; generally speaking bacteria are less susceptible to poisonous substances, such as most of the common antiseptics, than are the tissue-cells in the living mammalian body. It is thus impossible to destroy or even prevent the growth of the bacilli of diphtheria, tetanus, typhoid, anthrax, etc., in the living body through the agency of drugs, since the drugs would injure the patient before it killed these organisms.

In more recent times, drugs have been employed with success in the treatment of diseases caused by protozoal agency, and they have been shown to act by destroying the organisms. It is perhaps only natural that protozoa should be more susceptible to the action of drugs than bacteria; they are less highly organised, are not provided with a cell-wall of much significance, and their protoplasm is for the most part motile. Of these specific drugs which destroy protozoa quinine must rank first.

Quinine has long been used in the treatment of malaria; before the causation of this disease was known the benefit which accrued from dosing with quinine was held by the medical world to be due to its action upon the central nervous system. Binz found that quinine had a specific toxic action on undifferentiated protoplasm and elementary forms of life, and was led to predict from his experiments that the cause of malaria would ultimately be shown to be due to one of these elementary forms of life. He showed that a 1 in 50,000 solution of quinine hydrochloride rendered the common freshwater amoeba immobile, and that a 1 in 10,000 solution killed

paramæcia, and the spirochætes of ordinary vegetable decomposition. Nevertheless quinine shows some selective action. Ordinary sea amœbæ, though hardly distinguishable from their fresh-water brethren, are not affected by a 1 in 500 quinine solution, and the spirochætes of relapsing fever, though morphologically indistinguishable from those living in a normal mouth, are yet not influenced by the drug. The same is true of certain spermatozoa, though those of mammals are all destroyed by minute quantities of quinine. Quinine is a true specific in all early cases of malaria; it should be administered three or four hours before the attack is anticipated, because we know that three or four hours after the administration of quinine by the mouth the blood contains the maximum quantity of drug; furthermore, it is just at the onset of the attack that the malarial organism sets free its spores from the red-blood corpuscles into the blood and they are thus destroyed by the quinine as they are liberated. In latent malaria its potency, for reasons into which it is not necessary to enter here, is less marked, and quinine under these conditions may advantageously be administered along with arsenic and calomel. Warburg's tincture is an old fashioned remedy for these conditions containing besides quinine, opium, camphor, rhubarb, aloes, and a number of plants containing essential oils.

Mercury has a specific toxic effect on the organism of syphilis. It was employed in the treatment of skin diseases long before syphilis was recognised as a disease or before its introduction into Europe, and no doubt it was for this reason that it first came to be used in the treatment of syphilis. But great opposition was made to its use especially in the early part of the nineteenth century, and there were many who believed that the well-known lesions of syphilis were brought about by mercury. It was not until definite clinical experiments were carried out in comparatively recent times that its value was placed beyond dispute. The mode of action of this drug has been recently determined by Shaudinn. He found that a small spirochæte was the cause of the disease, and that this organism was very easily destroyed by solutions of mercury. Metchnikoff and Roux have shown that typical primary syphilitic lesions can be obtained in any part of the

skin of the higher apes, but that, if a mercurial ointment is rubbed in over the seat of infection, within an hour the organisms are destroyed and the disease does not develop. A medical student inoculated with syphilis, and subsequently subjected to inunctions of mercury, failed to contract the disease. Within the last year enormous doses of quinine have been employed in the treatment of syphilis, but the results do not on the whole warrant the continuation of its use in preference to mercury.

Trypanosomes, which form a considerable group of the protozoa, have lately grown in importance since they have been shown to be the cause of such diseases as sleeping sickness and nagana. These trypanosomes live in the blood of the infected animal at certain periods during the disease, and, if a drop of blood from such an animal is placed on a warm stage under a microscope, the activity of the organisms can be watched and the effect of drugs upon them determined. The aniline dyes were first employed for the destruction of trypanosomes. Wendelstadt administered one of these dyes, para-fuchsin, to mice and found that it rendered them immune for a considerable time to trypanosome infection. It is of little or no value as a curative agent, however, when once the disease has developed. Trypan red and many other aniline dyes have been employed but without satisfactory results. Arsenic acid has long been used in the treatment of diseases due to trypanosomes, and its value was first recognised by Laveran. A combination of arsenic with aniline and sold under the name of sodium anilarsenate or the trade name "atoxyl" has given better results. For sleeping sickness a 20 per cent. solution is injected warm hypodermically, each dose containing about two grains. Acetyl-atoxyl is even less poisonous than atoxyl, and is said by Ehrlich to cure mice infected with sleeping sickness in nearly a hundred per cent. of the cases. In other animals, including man, the treatment is not, however, very successful, possibly for one reason, because the drug is decomposed in the body. There is another great objection to the employment of arsenic, namely, that the trypanosomes become tolerant to the drug, and when they have once acquired this property it remains as an hereditary characteristic. In mice the trypanosomes can all be killed before this tolerance is acquired, but in man and other animals this is not the case,

and no doubt this fact is partly responsible for the unsatisfactory results which have been obtained in the treatment of sleeping sickness by atoxyl and other arsenical compounds. It is true that a similar type of resistance can be obtained to other trypanocidal substances, but the tolerance of trypanosomes to arsenic is of a degree out of all proportion to that which can be obtained with other substances. The explanation of this tolerance is possibly the non-absorption of the drug by the cell : the arsenic has the same action on the organism if it can reach it, but the living cell no longer takes up the drug. Arsenous acid administered to dogs or rabbits by the mouth soon begins to lose its specific action, because the cells of the alimentary canal refuse to absorb it, so that the arsenic passes out in the fæces unabsorbed : nevertheless, if the drug is injected it produces its ordinary action, at least for a time. It is not difficult then to imagine that trypanosomes acquire an immunity to arsenic in the same way as the epithelial cells of the alimentary canal.

In the search for another drug to supersede arsenic, the special committee on sleeping sickness of the Royal Society hit upon antimony, and found that this drug also had a specific action upon trypanosomes, and that it had little tendency to induce the condition of tolerance. Professor Woodhead and I have also tried the effect of antimony along with many other drugs in the treatment of nagana. Our procedure was to infect rabbits, rats, and mice with the disease, and then try the effect of drugs first *in vitro* upon a drop of blood on a warm stage, periodical observations being made with the microscope, and subsequently *in vivo*, the diseased animal being injected with the drug. Animals infected with nagana always die, rats generally in about one week, and rabbits within six weeks. Tartar emetic, the commonest salt of antimony, rapidly kills trypanosomes, and animals, affected with either of the fatal diseases, sleeping sickness or nagana, can be cured in a considerable percentage of the cases by suitable injections of the drug. How far this treatment will be successful in the case of diseased men, observation has not yet shown, but it is interesting that this old-world remedy should be brought to the foreground of medicine again with an enhanced value. In many ways, however, tartar emetic is an unsatisfactory drug, it

is so irritant that, when administered by the mouth, it induces vomiting so that but little is absorbed, and, when injected under the skin in anything but the most dilute solutions, it causes local tissue-destruction resulting in sloughing sores.

These results strongly suggest to my mind an explanation of the benefit which for a time accrues by the arsenical treatment of pernicious anæmia. In well-defined cases of this disease the administration of arsenic produces an almost immediate improvement: the red-blood corpuscles rapidly increase in numbers, and the patient may apparently regain normal condition. The disease however returns, and death practically always ensues. Now, arsenic in medicinal doses has little effect on the blood or bone marrow of material moment; it does not increase the number of red-blood corpuscles, nor stimulate their precursors in the bone marrow, and its physiological action affords no clue to its therapeutic value in pernicious anæmia. A satisfactory explanation of its action may be obtained from the knowledge that it has a destructive effect on many protozoa. If, then, pernicious anæmia be caused by some protozoon, the action of arsenic is readily understandable. Further, we have an explanation why, after prolonged treatment, arsenic ceases to have an effect on this disease, in the act that tolerance has been induced. Although it is impossible at present to show that pernicious anæmia is caused by some protozoon, yet such a view is strongly supported by the results which are seen on treating patients, suffering from this disease, with arsenic. It is desirable that other well-known drugs, such, for example, as quinine, antimony, and mercury, which specifically affect protozoa, should be employed in large doses in pernicious anæmia; valuable information might be obtained by such treatment.

There is one other disease, acute rheumatism, which may possibly be caused by an organism of the same class. Stockman has shown that in this disease the fall of temperature and the return of the joints to the normal condition vary, within certain limits, with the dose of salicylate administered, and that it is possible to bring down the temperature to normal in 24 hours by administering a sufficiency of the drug. The salicylates are absolute specifics for this disease. This has been shown, in an even more dramatic way, by directly injecting

sodium salicylate into one knee-joint, and carbolic acid as a control into the other, in a patient in whom both knees were affected with acute rheumatism. In the one the relief of pain and the return of the knee-joint to the normal condition was startling in its rapidity; in the other, in which the carbolic acid was administered, no noticeable effect was obtained. There is nothing in the pharmacological action of salicylates to account for their beneficial effect in acute rheumatism. The concentration to which they may attain in the blood is insufficient to affect bacteria, but is sufficient, as in the case of quinine, to have a marked destructive action on many protozoa. It is not improbable that acute rheumatism may also be the result of protozoa: the various bacteria claimed as the causation of this disease so far have all failed to conform with Koch's postulates.

Five different drugs have been mentioned, all of which have one action in common; they are all general protoplasmic poisons, and their action is primarily on relatively undifferentiated protoplasm such as the leucocytes of the blood, and protozoa. Some of them have a selective toxic effect on one form of protozoon and some on another. Quinine is specially toxic to the malaria organism, mercury to the spirochæte of syphilis, and antimony to trypanosomes, whilst the action of arsenic in pernicious anæmia, and the salicylates in acute rheumatism suggest that these diseases also may be protozoal in origin.



PUERPERAL PYÆMIA. VACCINE TREATMENT.

By JOHN T. HEWETSON, M.D., M.Ch., F.R.C.S.,

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THE following case illustrates the type of puerperal infection which is probably the most favourable for vaccine treatment:—

On July 28th, 1907, I was called into consultation by Dr. Ainscow to see Mrs. G., a primapara, aged 26, who was delivered of a healthy boy on July 23rd at 11 a.m. The labour was easy and natural, not even a digital examination being made. There was a slight tear of the perinæum, which was repaired by a single horsehair suture. As there had been no interference with the labour, douching was thought to be unnecessary. Up to the date of our consultation, the temperature, pulse, and all other conditions were perfectly satisfactory. On the morning of the 28th the doctor received an urgent summons to his patient. He found her in a very excited state, crying out for water, with a temperature of 105° and a pulse rate of 120 per minute. He also learned that, on the evening previous to this, the little household had been indulging in a family party, and that the patient's friends had stayed with her until after midnight. It was on account of the sudden change in his patient that Dr. Ainscow asked me to see her in consultation.

I found the patient with a good quiet facial expression, a dry furred tongue, a temperature of 103·5°, and a pulse rate of 120 per minute. The abdomen was slightly distended, but moving freely on respiration. The uterus was palpable, reaching to a point midway between the umbilicus and the pubis. It was not, however, tender, and there was no tenderness outside the uterus. The perinæal tear was covered with a thin whitish membrane. The lochia was still red, of a healthy appearance, and free from odour. The vagina was hot, the cervix showed no tear, and admitted two fingers readily. The uterus was movable, not tender, and, on exploring it with the fingers, was found to be perfectly empty.

In the left broad ligament there was a small thickening, which might have been due to thrombosis of the left uterine veins. I thought that the condition of the patient was probably due to some aberrant form of puerperal infection, with thrombosis of the left uterine veins. I was inclined to put down the site of infection to the slight perinæal tear, rather than to the endometrium. As the uterus had been explored with the finger, and as I could not entirely exclude the uterus, I washed out the endometrial cavity with 1 per cent. of lysol solution, and put into it afterwards a pack of iodoform gauze steeped in 1 per cent. formalin. The formalin gauze was removed in 24 hours. The patient was put upon lysol douches twice a day and quinine sulphate, gr. x., three times a day. I saw the patient again in two days, when there was little or no change in her condition. When I saw her for the third time, at the end of a week, the uterus had fallen considerably, and could just be felt above the pubis. There was little or no vaginal discharge. The external os was closed,

and, beyond the slight fulness in the left broad ligament, there were no abnormal physical signs whatever. During the week her temperature had run up to 103° at night, falling to normal in the morning. The abdomen remained slightly distended, and the tongue furred.

The doctor had noticed one or two red papules on the abdomen, and she had, during the week, one attack of epistaxis, and several loose stools suggestive of typhoid fever. We decided to have the blood examined for Widal's reaction. This was done at the pathological laboratory. The first report, on August 6th, was returned "doubtful." The second test, on August 9th, was returned as "positive," and the third, on August 21st, was "negative."

I saw the patient for the fourth time during the third week of her febrile attack. Her general condition was unaltered, the temperature varied between 101° and 103° at night, and the pulse kept uniformly at 110 per minute.

I did not see her again until her admission to hospital. Dr. Ainscow came to see me a few days before her admission to tell me that she was still having temperatures of 101° at night, and that she had within the last few days complained of pain and stiffness in the muscles of the left thigh.

The patient had never had a rigor at any time. When admitted to the General Hospital she looked pale, and had lost a great deal of flesh since my first visit to her on July 28th. The tongue was furred, the temperature was 101° , and the pulse 100 per minute. The heart and lungs were normal. There was little or no distension of the abdomen. The hepatic and splenic areas of dulness were normal. There was slight tenderness on pressing deeply into the pelvis. The uterus was slightly enlarged, the sound passing exactly 3 inches into the uterine cavity. The uterus was movable, anteverted, and not tender. The right appendages and broad ligament were healthy. In the base of the left broad ligament there was still a soft doughy thickening. The left appendages were to all appearance normal.

The left thigh was very much thicker than the right. On its posterior aspect, stretching from the ischial tuberosity to the knee, was an elongated oval swelling, fluctuating and slightly tender. The patient experienced considerable pain when any attempt was made to flex the hip or knee joint. The knee joint contained no excess of fluid. The left leg below the knee was slightly oedematous.

Five c.c. of blood were drawn off from the right median basilic vein under a strict aseptic technique, and then injected into sterile broth and upon Agar slope culture media, but no growth resulted.

The swelling in the left thigh was regarded as an abscess, arising from a septic embolus, or by direct extension from the thrombosed left internal pudic vein, as it lay in the gluteal region, or from thrombosis of the left uterine vein extending by the left internal iliac, thence through the left sacrosciatic notch to the left sciatic vein and thence to the hamstring region.

First operation, September 19th, under E_2C_1 anaesthetic mixture. I made an incision into the swelling in the left thigh, and evacuated about a pint of brownish pus of a creamy consistence. The abscess cavity was deep between the bone and the hamstring muscles. No bare bone could be

felt. The abscess cavity was flushed out and drained by two tubes, one in the popliteal space and the other just below the ischial tuberosity.

The pus from the abscess gave a pure growth of a streptococcus, and films from the pus also showed cocci in chains.

The abscess cavity slowly closed, and was healed in a little over three weeks from the operation. Her general progress was so satisfactory during the next fortnight that I decided not to prepare a vaccine from her organism. This decision I regretted very much later. On October 4th, her temperature rose suddenly to 102°. The cultivation growths from her abscess were found at this stage to be dead, and it was now too late to prepare a vaccine. I examined her chest carefully, on October 4th, and found a few fine crepitations at the left base. There was no dulness, however, and the air appeared to be entering very well. As the temperature for the next fortnight was anything but satisfactory, the chest was carefully watched from day to day, with very little alteration in the physical signs. On October 16th there was impaired dulness, slightly distant breath sounds, and absence of vocal fremitus. An exploring needle was passed into the chest in several directions over the impaired dulness, but no fluid or pus was obtained. On October 19th an exploring needle was again used and pus was found.

Second operation, October 19th, under local anæsthesia (eucaine and adrenalin). An incision was made in the 9th intercostal space in the posterior axillary line, and about 6 ounces of yellow pus were evacuated and a drainage tube was inserted.

The pus from the abscess gave a pure growth of a streptococcus, and films on pus showed cocci in chains. Her opsonic index to her own streptococcus was .6 on October 20th. I prepared a vaccine from this organism, and standardised it as approximately as the chains would admit to 50 million cocci per dose. The first dose was injected on the evening of October 25th. A second dose was given on October 27th, and then every six days for the next three weeks.

By October 29th the temperature fell to normal in the evening, and did not rise again above this point. She left the General Hospital on November 1st for the Jaffray Convalescent Hospital, where her vaccine injections were continued. Her future progress was uninterrupted. She left the Jaffray Hospital in three weeks perfectly healed and well.

Her doctor saw her about two months after returning home, and she was then doing her housework and in excellent health. The clinical course of the case is well seen in the accompanying charts.

Remarks.—This case is very instructive from several points of view. It shows how puerperal infection may occur—in labours where no digital examination is made, and no artificial help is given. The seat of infection was in all probability the perinæal tear. The nurse in charge of the case, during the first week, was the mother of the patient, and was wholly untrained. It is more than likely she did not attend to the external genitals properly, and that sepsis occurred in the perinæal tear on this account. I myself always make a rule of ordering vaginal douches for the first week, where

there has been any laceration of the lower vagina or external genitals. I believe that this is a safeguard against undue germ infection of the puerperal vagina, which normally does not remain germ-free for more than two or three days after labour.

The type of puerperal infection in this case was a somewhat unusual one. It was not, I am satisfied, an infection of the uterine cavity. It was, in all probability, a streptococcal infection of the small perinæal tear, which led to a septic thrombosis of the left internal pudic vein, and possibly to the

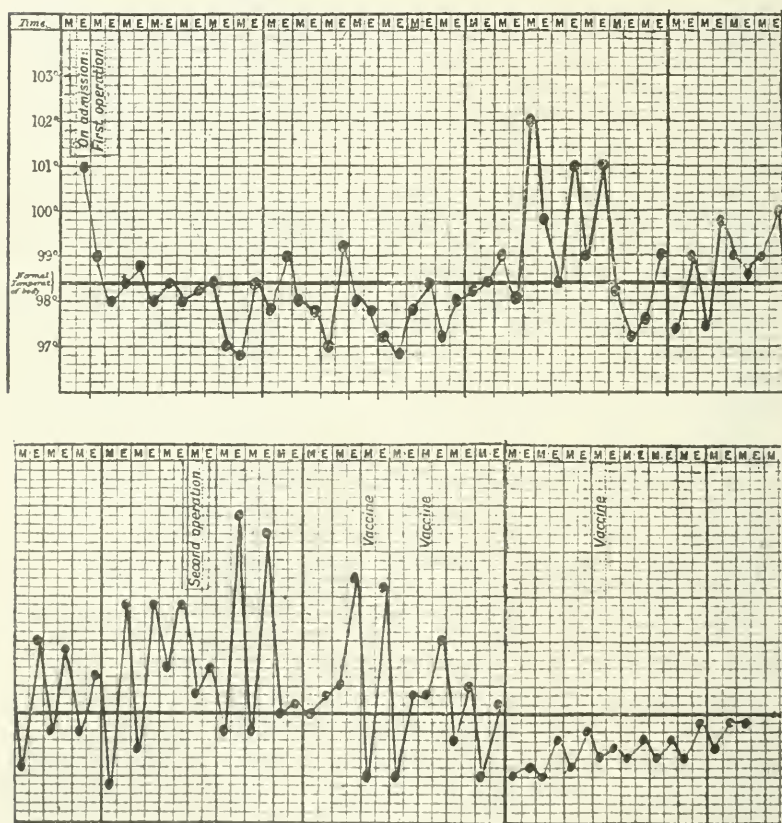


Fig. 1.

left internal iliac and uterine veins. From this toxins were absorbed into the system, producing the well-marked constitutional reaction of fever and increased pulse-rate. For

nearly two months the infection must have remained localised within the affected vein or veins. Later, pyæmic symptoms manifested themselves, as evidenced by septic emboli passing to the base of the left lung and there giving rise to suppuration. Whether the abscess of the left thigh was due to direct spread from the internal pudic vein as it passed through the gluteal region, or extension from the internal iliac vein through the greater sciatic notch, or to the passage of an embolus, there is no means of knowing.

It is surprising that septic thrombosis of the internal pudic veins is not a commoner occurrence as a sequela to perinæal tears, seeing that these are so difficult to keep clean owing to their proximity to the anus.

I have seldom seen a case of puerperal infection in its initial stages so puzzling, from the diagnostic point of view, as the case under discussion. In the early weeks there were practically no physical signs present to fully account for the severe constitutional symptoms. It was just this absence of pelvic signs, together with the existence of certain clinical phenomena, such as epistaxis, a papular rash, and liquid stools, which led us to have the blood examined for Widal's reaction. This, unfortunately, only produced further confusion. There is not the slightest reflection cast upon the Laboratory for the contradictory reports. These were made by the great authority Dr. C. J. Lewis, and, having seen all the reactions for myself, I had absolute proof of their accuracy. It only proves, however, that Widal's reaction, though probably the best known test of enteric fever, is liable to fallacies. No single test is infallible. It only goes to show that we can never dispense with a rigid and careful examination of patients in the study of disease.

Whether it would have been better to incise the left broad ligament from the vagina, in order to provide an exit for possible infected thrombus there, I do not know. I cannot help thinking that such disturbance might very readily dislodge infected clot, and set up a widespread pyæmia. It was the absence of rigors and other evidence of dissemination, which influenced us to trust to time and absolute rest, hoping that the infected area would become isolated, and that the constitutional symptoms would slowly abate.

Ligature of the left internal iliac occurred to me as a possible means of treatment. I have had one or two experiences of tying the internal iliac vein in puerperal septic phlebitis, but the results have not been encouraging. I preferred, in the absence of spreading infection, to await developments. After nearly two months of rest, the first abscess formed. It was an error of judgment on my part not to prepare a vaccine immediately after this first abscess was opened. It was just possible that the lung abscess would have been prevented had her resistance to this particular streptococcus been raised. Curiously enough, in August of this year, I had a case of puerperal infection very similar to the case just recorded. This second case I saw exactly two months after her labour. She had a complete tear of the perinæum, a boggy thickening in the right broad ligament, and an intraperitonæal abscess over the brim of the pelvis, just over the right sacroiliac joint. This abscess was probably due to direct infection from the right internal iliac vein. I opened this abscess, and the pus gave a growth of a streptococcus and staphylococcus albus. I prepared a vaccine from both organisms, giving 20 million of the streptococcus and 50 million of the staphylococcus at each dose, and injected her at once. A week after evacuation of the abscess she developed crepitations and dulness at the left pulmonary base, accompanied by a temperature of 101° at night. This led me to suspect the formation of another abscess. The chest was explored several times with a needle, but no pus or serum was ever found. The lung condition cleared up within two weeks, the temperature fell to normal, and the patient was quite healed and well within a month of her operation.

I mention this case merely to emphasise the importance of increasing the resistance of the patient to the particular causal germ, even after an abscess has been opened. Of course, I am not prepared to say that the vaccine was the essential factor which turned the scale in either case. I nevertheless believe that injection of a vaccine, prepared from the invading organism, is sound treatment as a routine in puerperal conditions of this kind. I have myself seen no good results whatever from polyvalent sera in puerperal infections. The investiga-

tions of Andrews and Horder upon the numerous varieties of streptococci fully explain the failures of serum treatment. Until we know more concerning the prevailing types of streptococci, which are admittedly the commonest causal germs of puerperal sepsis, we are not likely to obtain good results from polyvalent antistreptococci sera.

If there is time to prepare a vaccine from the organism present, it is unimportant whether the streptococcus is a *Pyogenes* or no, and equally unimportant to the surgeon what reaction it gives to the Gordon tests, so long as the vaccine of the special germ is given. What applies to the streptococcus must apply to the staphylococci, *Bacillus coli*, *Aerogenes*, *Sporulatus*, and other organisms causing puerperal sepsis. The day may come when all the types of streptococci causing puerperal sepsis will be known, and with such knowledge a stock vaccine may be obtainable ready to inject as promptly as the serum is now.

In cases of subacute infection, such as the case just described, there is ample time to prepare a vaccine from the causal germ.

In acute puerperal sepsis, however, there is little or no time to spare. The 36 or 48 hours necessary for the preparation of the vaccine are precious to the life of the patient, who is being rapidly poisoned by the infection. Furthermore, the onslaught of the germ invasion is so terrific that vaccines have little chance of warding off a lethal dose of toxin. I have tried vaccine treatment for acute puerperal infection in several cases without the slightest apparent benefit.

It is the subacute and chronic variety, including phlebitis, parametritis, and pyæmia, which offers the best field for vaccine treatment.



ADULTERATION OF FOOD.

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THE adulteration of food is not a modern art of our own generation, but has come down to us from antiquity, and there is every reason to believe that the practice was much in vogue long before any means were taken for its detection, or for the punishment of offenders.

Pliny mentions one article which was so extensively adulterated in his time that even the wealthier classes could not obtain it in a state of purity. It is known that, in England during the eleventh century, certain drugs and several articles of food were subjected to processes of sophistication, indeed, when the student of our social history pauses to reflect on the gross neglect of sanitation, and the adulteration and careless treatment of food, he will be struck with wonder that ancestors, so handicapped in the struggle for life, should have retained sufficient vitality to account for our own existence.

In early times, the traders most addicted to the practice were the vintners, the brewers, and the bakers. An article so appreciated as wine could not have long escaped the attention of the adulterators. A reference to unsound wine may be found in the annals of the Corporation of London for the year 1364. In this case, John Penrose, for selling red wine which was "unsound and unwholesome for man," was punished by being made to drink a draught of the same, and the remainder, we are quaintly informed, "shall then be poured on the head of the said John."

Neither does good old English ale appear to have been so harmless as is usually supposed. It is stated by Frederick Accum that, so long ago as the time of Queen Anne, the brewers were prohibited, under heavy penalties, from mixing *cocculus indicus*, or any other unwholesome ingredients, in their beer. The active principle of the *cocculus* is *picrotoxin*, and it was added to increase the intoxicating quality of beer.

There are very early references to the delinquencies of bakers. Riley, in his *Memorials of London*, mentions a baker, William de Somersete, in 1311, who was examined, and adjudged

upon, because it was found that his bread was "putrid and altogether rotten and made of putrid wheat, so that persons by eating that bread would be poisoned and choked." A later adulteration was to whiten bread, and thus conceal the inferior quality of the flour, by means of alum. It is impossible to say precisely when this custom arose, but the Annual Register, for 1764, records the conviction of a baker in Whitecross Street, for having a quantity of alum on his premises. Doubtless the practice was in vogue long before this date.

Not only was adulteration rampant in very early times, but there is evidence which tends to show that attempts were made to suppress it, and to punish the offenders. It appears that, in urban as well as country districts, the local government¹ used to be administered in many parts of England by a court, which derived its authority neither from statute or charter, nor from the inhabitants assembled in vestry. This was the manorial court, and the administrative authority, which concerns us, was the Court Leet and View of Frankpledge. This court had the powers of a local criminal court, and was presided over by the lord of the manor, or his steward. It appointed unpaid public officials for the suppression of nuisances, and had very wide powers, which even extended to the making of bye-laws for the better regulation of the district. The multifarious duties of this court are told by Samuel Butler, in "*Hudibras*,"—

Be forced t' impeach a broken hedge,
And pigs unringed, at Vis Franc Pledge?
Discover thieves and bawds, recusants,
Priests, witches, eves-droppers and nuisance,
Tell who did play at games unlawful,
And who filled pots of ale but half-full.

The court had many officers, and these would only be limited by the number of duties to be performed. Some corporations, in populous districts, appointed as many as 100 officials. There were constables to keep order, swine-ringers, pound-keepers, and burley-men, but the officials, which most concern us, were the ale-tasters or ale-conners, fish and flesh-wardens, and butter searchers to test the quality of the butter. That the food of the people was looked after, in early times, is shewn by certain papers of the Privy Council for the year

¹ See *English Local Government*, by Mr. and Mrs. Sidney Webb.

1630. This gave directions to stewards of the Leet that they do "specially inquire upon those articles, that tend to the reformation or punishment of common offences and abuses." Among other injunctions, we read that they should inquire about "tradesmen of all sorts for selling with under weights, or at excessive prices, or things unwholesome, or things made in deceit." At Birmingham, there were two high tasters to examine the goodness of the beer, and two low tasters or meat-conners, who inspected the meat exposed for sale, and caused that to be destroyed which was unfit for food. The officials were unpaid, but, in some instances, enjoyed a perquisite, as at Congleton, where the ale-conner received a glass of ale yearly from each publican. It is interesting to read that, at Faversham,¹ the officers were instructed to go round at irregular intervals when not expected, and thus forestalling the modern methods of sampling adopted by our sanitary inspectors.

One of the earliest writers to pay serious attention to food adulteration was Frederick Accum, whose treatise was published in 1820, and the subject was reviewed in a thoroughly scientific spirit. "To such perfection of ingenuity," says Accum, "has this system of adulterating food arrived, that spurious articles of various kinds are everywhere to be found, made up so skillfully as to baffle the discrimination of the most experienced judges." Accum described the particular adulteration of each trade with the means taken for its detection. He said he would be satisfied if his treatise should impress on the mind of the public the magnitude of the evil, which, in many cases, prevailed to an extent so alarming that we might exclaim with the sons of the Prophet, "there is death in the pot."² Not long after Accum's book, a little work with a very long title, was published by an anonymous writer. This book, written in somewhat exaggerated language, had a large circulation, and attracted much attention. It was written in a popular style, and created a great impression on the public mind. Among other things referred to was the sanding of sugar, the colouring of pickles with copper, the addition of alum to bread, the sophistication of tea with various kinds of leaves from other

¹ *Municipal Corporations Commission*, 1835, II, 964.

² II. *Kings*, IV., 40.

plants, and the colouring of confectionery with dangerous mineral substances. There is no doubt that this work, perhaps more than any other means, did much to prepare the way for more serious consideration of the question. Very little was done, however, until twenty years later, when the detection of the extensive frauds on the public was studied from a scientific standpoint. A series of investigations were undertaken under the direction of Dr. Hassall, and other pioneers in the reform of food adulteration, and these culminated in some powerful articles in the year 1851. These investigations may be said to be the basis of all our modern laws on food adulteration. In connection with the inquiries, the names of important firms were freely published as having supplied food of an injurious character. The inquiry did a vast amount of good, tending as it did towards the suppression of fraud, and the success was undoubtedly due to the courageous manner in which the matter was taken up by Mr. Wakley. Mr. Wakley's influence led to the appointment of the Select Committee of 1855, when a large volume of evidence was heard, including such leading experts as Dr. Hassall, Dr. Letheby, and Dr. W. B. Carpenter. The result of the Select Committee's report was the Act of 1860, which was followed some years afterwards, in 1872, by further legislation. These two Acts were subsequently repealed, but they formed the basis for the principal food Act of 1875, and the further enactment of 1899.

Dr. Hassall gave some very valuable and exhaustive evidence before this Committee, and his labours were much facilitated by the microscope, which had not hitherto been extensively used. The neglect of this valuable adjunct by the excise and others will no doubt partly account for the excessive adulteration which was shown to prevail. Indeed only a few years before this time, the then Chancellor of the Exchequer quoted, in the House of Commons, the opinion of three of the most distinguished chemists of the day, who had affirmed that "neither by chemistry nor by any other means was the admixture of chicory with coffee to be detected." In his analyses for the Analytical Sanitary Commission of the *Lancet*, Hassall found from the examination of 96 specimens of coffee, purchased at different shops, that 80 or 83 per cent.

had been adulterated with the chicory root. In addition to chicory, some specimens contained roasted corn, ground beans, or potato flour.

Sugar.—Sugar, another important article of diet, showed extensive adulteration. Hassall analysed 72 specimens of brown sugar, and 71 contained “disgusting insects” of the natural order allied to that causing the itch. In the majority of instances, the “acari” swarmed in great numbers. Besides these insects there were sporules and filaments of fungi in a large proportion of the cases. There was a variable quantity of vegetable albumin and pieces of woody fibre in nearly all the specimens. Six samples contained flour in such considerable proportions that it must have been used as an adulterant.

Stony particles or grit were present in many of the sugars, but whether in sufficient quantities to merit the “sanding of sugar,” Hassall does not inform us.

Pepper, Mustard, Vinegar, etc.—More than half the samples of black and white pepper were adulterated, and Hassall came to the conclusion that “genuine mustard, whatever be the price paid for it, is scarcely ever to be obtained.” In fact the Government by reason of the impossibility of obtaining pure mustard established a factory for its manufacture at Deptford. Nearly half the specimens of cayenne pepper contained red lead, “often in large and poisonous proportions,” and the same poisonous substance was found in samples of curry powder.

Sulphuric acid was present in two-thirds of the specimens of vinegar. The common vinegar sold to the poor for the seasoning of oysters was nothing but a mixture of sulphuric acid, burnt sugar, and water. Corrosive sublimate was used to correct the flavour and roughness of the sulphuric acid. The adulteration of vinegar was so excessive that certain terms were well known in the trade for the adulterants. Thus D.W. stood for distilled water, O.V. for oil of vitriol or sulphuric acid, and corrosive sublimate was appropriately referred to as “the Doctor.”

Cereals and Bread.—Cereals and the different articles of diet, manufactured therefrom, are of paramount importance to the human race, and there is no fact in epidemiology¹ more

¹ See article by Special Correspondent on the present epidemic of cholera in Russia; *Times*, September 24, 1908.

clearly established than the closer correspondence between periods of scarcity and the prevalence of the principal zymotic diseases, but this is a matter which hardly comes within the scope of the present paper, except in so far that, during periods of scarcity and high prices, there will naturally be a greater tendency to the adulteration of food with cheap substitutes.

It was in evidence before the Committee that practically all the samples of bread contained alum, and an instance was mentioned of flour, with which as much as ten per cent. had been mixed. The symptoms generally observed are an unpleasant taste in the mouth, with swelling followed by shrinking of the gums, and sometimes in delicate people the teeth fall out. In the trade, the adulterant received the name of "roughs."

The repeated use of alumed bread in large towns was a prolific cause of dyspepsia, and the great consumption of purgative medicines. Professor W. B. Carpenter testified before the Committee to the injury caused by even the smallest quantity of alum. He found in his experience that one of the most prevailing complaints was costiveness, and he thought that the alum in bread had something to do with it.

It was stated that a common practice was to mix alum and whiting with potatoes, and make this up with flour into bread. Sometimes a ton of whiting, and as much as two or three hundredweight of alum would be purchased at one time by the baker.

Arrowroot, an important article of diet for invalids, was extensively adulterated; Hassall found that nearly half of the specimens were blended with cheaper starches of an inferior quality. Oatmeal was frequently found mixed with every description of refuse. A celebrated case was tried before the Court of Justiciary at Glasgow, in 1847, where the contractor of a large consignment of oatmeal for destitute Highlanders was ordered to be fined and imprisoned for supplying an article mixed with bran, and a substance called "thirds," which was the refuse and shell of wheat. In his defence the accused party brought forward the principal

millers of Glasgow to swear that what he had done was quite a common practice in the trade.

Cocoa.—Hassall examined 56 samples of cocoa, bought at different shops, and only eight were found to be genuine; the common adulterants were sugar and foreign starches, which were present in amounts up to 50 per cent. Normandy reported that chocolate was often mixed with brick-dust, and he had found as much as 22 per cent. of peroxide of iron.

Tea.—A common sophistication was spurious or “lie” tea. This was sold by the Chinese to English merchants for purposes of adulteration, but was never used by the Chinese themselves. It contained from 20 to 40 per cent. of sand mixed with the refuse of the tea leaf. The whole was worked up into a mass with gum and starch, and, when granulated, was painted to represent green tea. An immense quantity of this “lie” tea was annually imported.

Spurious tea was made up in this country from exhausted tea leaves, and from the leaves of the sloe, hawthorn, beech, elder, fancy oak, and willow. The leaves were dried, broken up, passed through a sieve, gathered up by gum water, rolled into pieces, faced with colouring matter, and “bloomed” by being put into a bag with magnesia, French chalk, or sulphate of lime.

Milk.—Milk used to be frequently mixed with water. Hassall reported on 26 milks purchased from different shops, and he found that 14, or 54 per cent., were adulterated, two showing abstraction of milk fat, and the remaining twelve addition of water in amounts varying from 10 to 50 per cent. Lindsey Blyth and Challice mention cases in which the milk had been mixed with chalk, but there is no ground for believing that this was ever a common practice. A curious instance of the adulteration of milk with boiled white carrots was brought to the notice of the Committee.

Bottled Fruits, Vegetables, and Preserves.—These used to be invariably contaminated with copper. In four samples, out of a total of 33 examined, Hassall concluded that the copper was present in “poisonous” doses. Preserves and jams frequently contained a large amount of copper taken up from the vessels in which they were prepared.

Coloured Sugar Confectionery.—Hassall examined upwards of a hundred specimens of sugar confectionery, and they

contained the following dangerous colouring ingredients, viz.:—

Chromate of lead in	-	-	-	59	samples.
Gamboge	-	-	-	11	„
Red lead	-	-	-	12	„
Cinnabar or sulphide of mercury	-	-	-	6	„
Brunswick green, mixture of lead chromate and prussian blue	-	-	-	10	„
Carbonate of copper	-	-	-	1	„
Scheele's green or rasenite of copper	-	-	-	9	„

Scarcely a year passed without serious accidents from the employment of pigments used in coloured confectionery. Letheby thought they were the most common and serious of all adulterants of that kind, “there is not an article of confectionery,” he said, “which is not so coloured,” and he produced before the Committee a sample containing enough chromate of lead to do very serious mischief. He related other evidences of injury, and particularly the Whitechapel experience, where a number of persons were poisoned by confectionery sold in the neighbourhood of Petticoat Lane. One of the patients died, and the contents of the stomach, when analysed by Letheby, were found to contain lead and arsenic which, on inquiry, were proved to be the cause of the mischief. Other cases of children being poisoned by arsenic used to colour sweets were mentioned to the Committee by Professor Swaine Taylor. Taylor condemned the careless use by cooks of flavouring essences, some of which contained more than one per cent. of prussic acid. He stated that he had known of a case in which a woman of 39 was killed by half an ounce of one of these compounds.

Wine, Beer, and Spirits.—These articles used to be universally adulterated, and a great deal of evidence was laid before the Committee. Port wine was made from bad claret and red Italian wines bought at about seven pence a gallon. To this was added geropiga, dried extract of elderberry juice, Lisbon grapes, brown sugar, brandy, bitter almonds, and logwood, and the mixture was made up under the name of London port, and sold at from twelve to fifteen shillings a gallon.

Mr. Lytton, H.M. Secretary of Legation at Lisbon, reported, in 1867, that “all port wine hitherto exported for the English market is largely mixed with brandy, and is composed almost quite as much of elderberries as of grapes; this is the

composition of all the port wine hitherto drunk in England. No pure wine, no wine not thus specially adulterated for the English taste, was allowed by the Government Committee of Tasters to pass the bar of the Douro for export to England before the year 1865."

Sherry was practically brandy and water flavoured with a little bitter almonds, and an important witness, who had resided for a long time in Spain, testified,¹ that "no natural sherry comes to this country—none whatever." The state of the wine trade may be inferred from the following advertisement, which appeared in the columns of *The Times*:—

"Partner wanted.—A practical distiller, having been experimenting for the last seventeen years, can now produce a fair port and sherry, by fermentation, without a drop of the grape juice, and wishes a party with from £2,000 to £3,000 to establish a house in Hamburg for the manufacture of wines. Has already a good connection in business."

Beer was likewise the subject of much adulteration. I have already alluded to the extensive practices of the brewer in the drugging of beer and porter with *cocculus indicus*. Between 1815 and 1818, a number of brewers were prosecuted, and fined in sums, varying from £25 to £600, for receiving and using drugs in brewing, viz., *cocculus indicus*, Spanish liquorice, and coriander seeds. There is reason to believe that tobacco, opium, and other drugs were added to beer to produce a narcotic effect.

The *cocculus indicus*, or its active principle picrotoxin, produces a sensation not amounting to intoxication, but of a kind of loss of power or tremulousness, and a waking dreaminess, as if you were conscious of things about you, but with no power to move or exert yourself. Wepfer and Orfila found that the powder of the seeds caused speedy death in dogs by destroying the irritability of the heart. Several men suffered from this poison, in 1829, near Liverpool. Each had a glass of rum strongly impregnated with *cocculus indicus*; one died that evening, the rest recovered. The symptoms were vomiting, tormina, and deep stupor.²

The mixture of the *cocculus* with beer was unblushingly recommended in the trade receipt books. It was kept by brewers' druggists, and sold to brewers under the name of

¹ Select Committee on Import Duties on Wines, 1852, Q. 5717.

² Traill's *Medical Jurisprudence*, 1840, p. 145.

“multum” or “hard mixture.” The “heading” added to porter was a mixture of alum and sulphate of iron, and was so called “from giving to porter that beautiful head or froth.”¹

The foregoing gives a brief idea of the extent of adulteration in vogue before the Food and Drugs Acts came into force. The Committee of the House of Commons were very much impressed with the evidence, and could not “avoid the conclusion that adulteration widely prevails . . . not only is the public health thus exposed to danger, and pecuniary fraud committed on the whole community, but the public morality is tainted, and the high commercial character of the country seriously lowered, both at home and abroad, in the eyes of foreign countries.”

We may now inquire, what has been the effect of the Act of 1875?

Some idea may be gathered from the reports of the Local Government Board. The ensuing table sets forth, for England and Wales, the number of samples purchased per 1,000 of the population, the number of persons relatively to each sample purchased, and the percentage of adulteration in quinquennial periods since 1877:—

Quinquennium.	Average Annual Samples per 1,000 of the Population.	Number of Persons relatively to each Sample purchased.	Percentage of Adulteration.
1877-1881 - -	0·66	1,520	16·2
1882-1886 - -	0·81	1,237	13·9
1887-1891 - -	0·94	1,060	11·7
1892-1896 - -	1·31	758	10·6
1897-1901 - -	1·75	569	9·0
1902-1906 - -	2·52	397	8·5

It will be seen that, speaking generally, the adulteration has varied inversely with the number of samples purchased, and that, over the whole period of thirty years, there has been a diminution from 16·2 to 8·5 per cent., or a percentage reduction of 48.

But the comparative freedom from food adulteration, enjoyed by the present generation, is not entirely the result of

¹ *Every Man His Own Brewer*, by Samuel Child.

the operation of these Acts of Parliament. It will be understood that when an article, like flour or bread, either from improved methods of agriculture and manufacture, or from the removal of duties, or other causes, becomes cheaper, the margin of profit is not sufficient to pay for adulteration, and hence the purity of many articles of food, and I am more especially referring to bread and tea, has been partly brought about by other means. We must also not forget in considering these figures, that, although adulteration has considerably diminished, its incidence has completely changed, and this is partly due to the introduction of chemical preservatives during the last twenty-five years.

Although we still have cases of watered milk, the classical adulterations of bread with alum, of tea with foreign leaves, of coffee with chicory, of sugar, mustard, and pepper described above, are mainly now matters only of historical interest. In their place we have the addition of different chemical substances to food, and it is no exaggeration to say that the chief work of the present-day analyst is now centred on the detection and estimation of these preservatives. It appears therefore that there is still considerable injury caused to the public health, and the danger, I am inclined to think, is greater than it was some fifty years ago, for it is the common articles of consumption, like milk, butter, and preserved meats, which are so injuriously drugged with boracic acid and other preservatives. I believe that the general public, and even many members of the Medical profession, have no conception of the extent to which the practice prevails. A Committee of the Local Government Board, in 1901, issued some excellent, if not very drastic recommendations, and it is difficult to understand why the matter has not hitherto received the attention of Parliament. We sadly want another Thomas Wakley to take up this question of the mischievous poisoning of the food of the people ; but I am in hopes that the President of the Local Government Board will be able to assist us. Mr. John Burns would certainly add to his well-earned reputation for reform in public health administration if some time during his tenure of office he were to introduce legislation on the lines of the Preservative Committee's Report.

PAROXYSMAL TACHYCARDIA.

WITH NOTES OF A CASE OCCURRING IN MOTHER AND DAUGHTER.

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Case I.—The following case was admitted into the Bristol Royal Infirmary on November 28, 1907, under the care of Dr. Prowse, to whom I am indebted for permission to publish it.

M. B., female, aged 16, tobacco-worker.—The family history, with the exception of that of the mother, is unimportant. There is no history of fits or other neurosis in the family. The patient herself is said to have been, with one exception, always healthy. She is said to have never suffered from any of the usual infantile diseases. There is no history of rheumatism or chorea. At the age of 14 she had an attack of "weak heart" which kept her in bed a month. She states that the first thing noticed during the attack was that her heart was beating fast, and after two days she had to go to bed as she did not feel able to be up. She remained in bed a month, and, while in bed, her feet swelled up just as in the present attack. She had some pain in the neighbourhood of the heart and vomited once or twice. She suddenly became distinctly better though she took some days to get over it. There was no known cause. Since then she has been unable to run much without getting breathless.

The present attack began a fortnight before admission with palpitation after her food. After this had continued for a week she was seen by a medical man, who failed to find anything definitely wrong with her. She, however, went to bed as she did not feel able to be up. Two days before admission, she suddenly became very much worse with pain, which she referred to the abdomen, and occasional vomiting after food. When seen by her doctor, she was found in a very collapsed condition with her pulse over 200, and sent into the Bristol Infirmary.

On admission, she was in an extremely prostrate condition, almost aphonic. Temperature 97°, respirations 32, pulse hardly felt at the wrist, and about 240 at the apex beat. She complained of severe pain all over the abdomen, and was constantly retching, though she brought nothing up. There was considerable œdema of both legs, and the face was slightly puffy, the forehead pitting on pressure. There was no cyanosis, and her face did not suggest an abdominal condition. The abdomen was slightly distended, and moved fairly well on respiration. There was extreme hyperæsthesia of the skin over the whole of the abdomen extending up to the level of the sixth rib on the chest and downwards for a short distance over both thighs. On palpation, there was a moderate resistance, and the patient complained of great pain. On pressing upwards from the epigastrium, the patient at once began to retch. The liver dulness was

normal, and free fluid could not be demonstrated in the abdomen. During the abdominal examination, the patient gave two surprisingly vigorous coughs in which the abdominal muscles moved freely without any sign of pain. The examination of the heart showed the following:—The absolute cardiac dulness extended from the left border of the sternum to just outside the nipple line. The apex beat was diffuse and wavy. No venous pulsation was seen in the neck. On auscultation the first and second sounds were almost alike, and there was no murmur. The rate was 240 and appeared perfectly regular. The urine was acid, sp. gr. 1020, slight trace of albumen, 0·8 per 1,000, urea 2·8 per cent., excess of phosphates, uric acid 0·0347 n., deposit, urates, epithelium, few fatty casts. The blood showed 4,600,000 red cells and 4,200 white cells per cmm. The patient was at first admitted to a surgical ward, but was afterwards transferred to the medical side.

On the next day, the 29th, the patient was in much the same condition, temperature 96° in the axilla, apex beat 220, respirations 32. The œdema of the legs was slightly increased, and was becoming marked on the back. She was unable to lie on her right side, becoming at once cyanosed. There was some dulness at the left base, with diminished breath sounds and marked crepitations. The urine for 24 hours amounted to 25 ounces.

On the 30th, the pulse was 200, the respirations 36. The patient was in much the same condition, but the œdema was increasing, and the apex beat was now $\frac{1}{2}$ inch outside the nipple line. No venous pulsation could be seen in the neck. She was taking peptonised milk with difficulty.

On the 1st December, patient was as before.

On the 2nd, visible venous pulsation was for the first time seen in the neck. No enlargement of the liver could be made out. She continued in much the same state until the evening of the 4th, when the pulse was 168, the temperature 95·4°, and the respirations 28. She, however, looked better and had taken some custard.

On the morning of the 5th at 4 a.m. the pulse was 156, at 8 a.m. 84, at 10 a.m. 66. The patient felt quite comfortable and hungry.

On the 6th the pulse was 60, at times irregular, the patient felt quite comfortable and was on ordinary diet. From this time onward she convalesced without any further symptoms. The cardiac enlargement and œdema rapidly disappeared, and, within two days of the pulse rate falling, the apex beat was $\frac{1}{4}$ inch inside the nipple line. On auscultation, a well-marked mitral systolic murmur was now heard conducted into the axilla, which murmur she retained until discharge.

Case II.—A few weeks later the mother of M. B. was admitted under the care of Dr. Charles, to whom I am indebted for permission to refer to the case.

On admission she was a somewhat poorly nourished woman of 43. She had had five children, and for some years she had had to maintain them. For seven years she had had very frequent attacks of tachycardia. The first one was brought on by a severe strain lifting a weight, which, at the same time, produced an abdominal hernia. The attacks are now brought on very readily by any moderate strain, or more readily by mental emotion. During most of the attacks, she is conscious of her heart beating rapidly, but is generally able to go on with her work, though at times she

has to sit down. They last from several minutes to four or five hours. They always cease abruptly. During the last few months, the attacks have been coming more frequently, sometimes several times a day, and she has not felt able for her work.

On admission, the condition of the patient's heart was as follows:—The apex beat was in the 5th space just inside the nipple line. On palpation there was a distinct presystolic thrill. On auscultation at the apex, there was a well-marked presystolic murmur. During her residence in hospital, the patient had many attacks of tachycardia, commencing and terminating abruptly. During the attack, the apex beat rate was between 200–240, and, on auscultation, the first and second sounds appeared almost identical, and the presystolic murmur disappeared.

Unfortunately in neither of the cases were venous pulse tracings obtained.

Under the terms Paroxysmal and Essential Tachycardia, many cases have been recorded with more or less of the same features as the two cases given above. The one characteristic, common to all, is the sudden occurrence of extremely rapid heart action, which after lasting a variable time, from a few minutes to weeks, ceases as abruptly as it began. The transition from a pulse of normal regularity and rate to one beating between 200 and 300 times a minute is absolutely abrupt. As a rule, during the attack of tachycardia, the pulse is quite regular, and any murmurs, which may be present in the intervals, may disappear during the attack. Occasionally the attack is preceded and followed by a certain amount of irregularity of the heart. As pointed out by Hoffmann,¹ the rate, at the commencement of the attack, is exactly the double or quadruple of the original rate. During the attack itself, the rate varies by a few beats per minute to be replaced at the sudden termination of the attack by a rate of one half or one quarter. This exact correspondence, however, is not always seen.

One of the most characteristic features of the condition is the remarkably slight disturbance of the general health. Thus, in Bristowe's Case 4,² the patient, a lady, continued to travel about inspecting schools for six weeks, during the whole of which time the heart was beating between 200 and 260 a minute. The heart itself during an attack, lasting days, may show no sign of dilatation either to percussion or the X-rays. On the other hand, after lasting a variable time signs of definite enlargement and of blood stasis, as in Case I., may occur and

¹ *Deutsch-Arch. f. klin. Med.*, 1903, p. 44.

² *Bruin*, Vol. X., p. 165.

become marked, to rapidly disappear on the abrupt cessation of the attack. On the other hand, an attack may eventually end in death, or the patient, in the midst of apparent perfect health, may suddenly die. In the intervals between the attacks, in many cases, the heart appears perfectly normal, in others, there are signs of valvular, myocardial, or pericardial disease. The attacks may occur several times a day, or at intervals of months or years, or may apparently cease.

In 53 cases, collected by Herringham,¹ there were 30 males and 23 females, and further observation has shown that sex has little or no influence on the occurrence of the condition. The first attack may appear in early childhood, and the condition may last through a long and busy life, or it may first appear at an advanced age. Thus Emanuel² records a case in a boy, aged eight, in whom the attacks had appeared at the age of two. Eccles³ reports a case in a lady, aged 50, who, since the age of three, had suffered from repeated attacks lasting as long as one month; Herringham, a case beginning at the age of five; Hoffmann,⁴ a case in a male, aged 52, whose first attack occurred at the age of nine, but who had led an energetic life up to the time of observation. In another case, seen by Hoffmann, the attacks began at 58, the patient being 73 when he came under observation. Watson Williams⁵ mentions a case in a male, aged 81. H. C. Wood,⁶ a case in a male, aged 87, who, for 50 years, had suffered from repeated attacks. Cases occurring in members of the same family have but rarely been reported. In Watson Williams' case, the mother had similar attacks. Oettinger¹ reports a case probably hereditary for four generations, and Faisins⁷ a case, in whom the mother was known to have attacks, and the brother was said to have died from a "neurosis of the heart."

The most frequent exciting cause of the primary attack is a severe strain, as in Case II., next in frequency mental

¹ *Edin. Med. Jour.*, 1897, p. 366.

² *Brit. Med. Jour.*, 1906, p. 860.

³ *Lancet*, 1897, Vol. 2, p. 118.

⁴ *Deut. Arch. f. klin. Med.*, Vol. 78, p. 44.

⁵ *Bristol Med. Jour.* June, 1897.

⁶ Quoted from Osler.

⁷ Quoted from Herringham.

excitement or severe shock, as in a case by Morrissey,¹ in a female, who, at the age of 18, when walking over a field, fell into an unused well, from which she was extricated in a few minutes, physically unhurt, but ever after suffered from attacks of tachycardia. As pointed out by several authors in many of the cases attributed to shock, there is also an opportunity for strain, as in efforts to avoid some impending danger. A considerable number of the cases are preceded by gastric symptoms, and a few have been accompanied by intestinal parasites. In many cases there is no obvious cause. Yet other cases arise in the course of or during convalescence from acute specific fevers, as typhoid,² and measles,³ and not infrequently after diphtheria.

It is questionable if Buckland's case, frequently quoted as arising during an attack of measles, can be considered as in any way related to the attack of measles, as the child, a girl, aged 11, had been under his care for some weeks before for palpitation, shortness of breath, and fainting on slight exertion. The attacks of palpitation had been frequent for five or six years.

Although, in many of the cases, the physical signs and symptoms are confined to the heart, there are in other cases, especially in those in whom the heart is apparently sound, symptoms which point to the condition not being altogether limited to the heart. Thus in a case reported by Cotton,⁴ there were, in a male, aged 42, at intervals of a few months, attacks in which the pulse suddenly rose to 230, preceded by loss of appetite, acidity, and disordered stomach. Hay⁵ records the case of a boy, aged 6, in whom the attacks were initiated by vomiting. Sir James Barr⁶ also reports the case of a male, aged 19, in whom the onset was frequently accompanied by vomiting, and there are numerous others in the literature. R. O. Moon⁷ reports the case of a girl, aged 20, in whom the attacks frequently came on suddenly, but at other times

¹ *Med. Record*, 1905, p. 899.

² Krehl. Noth., *Enc. Med. Diseases of the Heart*, p. 747.

³ Buckland: *Trans. Clin. Soc.*, Vol. 25, p. 92.

⁴ *Brit. Med. Jour.*, 1866.

⁵ *Edin. Med. Jour.*, 1907, p. 42.

⁶ *Brit. Med. Jour.*, 1904, July 16.

⁷ *Lancet*, 1907, p. 1084.

were preceded for a few hours by weakness of voice passing almost into aphonia. Hoffmann¹ records three cases associated, during the attack, with polyuria and a normal blood pressure. Rose² reports a case in a male, aged 48, in whom the attacks had commenced with severe pain in the stomach and vomiting, and were frequently preceded by the passage of large quantities of urine. Traves Smith³ reports a case in a girl beginning at the age of 13 without known cause. Within six months, typical attacks of major and minor epilepsy appeared. The attacks of tachycardia were followed by polyuria. There was a marked history of epilepsy on the maternal side. After a fortnight's treatment by bromides, the epileptic attacks, and the attacks of tachycardia, which, before treatment had been occurring several times a day, remained absent for the seven months to which the report applies. Debove⁴ records a case in which the attacks began with loss of consciousness; O'Carroll,⁵ the case of a female, aged 39, in whom attacks came on with dimness, occasionally complete loss, of vision, pain behind the sternum, and several times loss of consciousness. This patient was markedly improved by bromides.

The lungs, as a rule, are unaffected, except from the result of secondary stasis, which leads to œdema, and occasionally marked hæmoptysis. Tuczek, Kredel, and Honningham,⁶ however, report cases, in whom the boundaries of the lungs were, in the course of an attack, suddenly found unusually low, while the absolute heart dulness was diminished, or even disappeared. The emphysema subsided more or less rapidly after an attack. Other observers have also noted a certain amount of emphysema during an attack.

Nothnagel was the first to call attention to the association of paroxysmal tachycardia and epilepsy. Schlesinger⁷ found epilepsy in 25 per cent. of his cases, but they were all cases of symptomatic epilepsy with organic cerebral changes. Allbutt⁸ mentions a case in which attacks of paroxysmal

¹ *Deut. Arch. f. klin. Med.*, Bd. 51, 8, 24.

² *Berlin klin. Woch.*, 1901, Nos. 27 and 28.

³ *Trans. Royal Soc. Med. Irel.*, 1903, p. 19.

⁴ Quoted from Herringham.

⁵ *Trans. Royal Soc. Med. Irel.*, 1903.

⁶ Quoted Noth., *Encl. Med. Diseases of the Heart*, p. 745.

⁷ Quoted Schmoll, *Amer. Jour. Med. Sciences*, 1907.

⁸ Allbutt, *System Med.*, Vol. V., p. 828.

tachycardia began at 14, epilepsy at 42, both diseases running a quite independent course. Traves Smith's case has already been mentioned. Epileptoid attacks, similar to those occurring in Stokes Adam's disease, depending, in all probability, on cerebral anæmia, have been described in paroxysmal tachycardia by Clark¹ and others, and must be clearly distinguished from true epilepsy. In other cases the condition has occurred in the subjects of tabes dorsalis, and after blows on the head.² Muller³ reports a typical case combined with disseminated sclerosis in whom, post-mortem, an extensive involvement of the vagus nuclei was found. Reinhold⁴ describes a case associated with cerebral syphilis in whom, post-mortem, a lesion of the medulla oblongata was found, the result of syphilitic endarteritis of the basilar artery. Likewise cases of cerebral tumour have been reported associated with paroxysmal tachycardia. In a case of Reinhold's there was a tumour of the left cerebral hemisphere.

The following are some of the conditions which have been found post-mortem. Bristowe,⁵ in a youth, aged 19, in whom the attacks followed a severe strain, and in whom, in the intervals of the attacks, there was always a systolic murmur, found, macroscopically and microscopically, the valves and muscles normal. Sir Thomas Watson also failed to find any change in the heart of his case. In six autopsies collected by Herringham, in two there was cardiac fibrosis, in one myocarditis, and in one pericardial adhesions. In 13 cases, examined by Hoffmann, there were myocardial changes in all, usually recent, and the medulla oblongata and vagus nerves were normal. In one case of Mackenzie's,⁶ the autopsy showed endarteritis obliterating the artery supplying the atrio-ventricular bundle and patches of fibrous tissue affecting the muscle wall of the heart, and the remains of the primitive cardiac tissue. As already mentioned, Muller in his case found extensive involvement of the vagal nuclei. Schlesinger⁷

¹ *Brit. Med. Jour.*, 1907, Vol. II., p. 308.

² Quoted Schmoll.

³ Quoted Schmoll, *Multiple Sclerosis*, Jena, 1904.

⁴ *Zeitsch. f. klin. Med.*, Vol. 59.

⁵ *Brain*, Vol. X.

⁶ *Quart. Jour. of Med.*, 1908, Vol. I., p. 484.

⁷ Quoted Schmoll.

reports a case, in which the main lesion found was a neuritis affecting the right vagus nerve. During life, pressure on the right vagus stopped an attack, though pressure on the left had no effect. Reinhold's case, with a syphilitic lesion of the medulla oblongata, has already been mentioned. Schmoll reports a similar case without post-mortem. Reinhold's case, with a tumour of the temporo-sphenoidal lobe, has also been mentioned.

From the foregoing, it is obvious that several different conditions are included under the same term.

With regard to the actual changes in the heart rhythm, during an attack of paroxysmal tachycardia, as revealed by venous and arterial pulse tracings, these have in several cases been thoroughly worked out by Hoffmann, Mackenzie, Hay, Schmoll, Hirschfelder, and others. Hoffmann was the first to point out that the increased frequency of the pulse rate is due to a series of extra systoles. Mackenzie¹ and Hay² are agreed that the attack is due to a series of extra systoles simultaneously involving both the auricle and ventricle. As this condition can only arise from stimuli, originating somewhere below the venous sinus, Hay considers that the stimuli arise somewhere in the atrio-ventricular bundle; Mackenzie, more definitely, traces their origin to the auriculo-ventricular node of Tawara. Mackenzie and Hay would limit the term paroxysmal tachycardia to cases showing this nodal rhythm. Hirschfelder's³ case also showed the nodal rhythm. Schmoll⁴ also exhibits tracings, showing the nodal rhythm which he likewise attributes to stimuli, originating in the bundle of His; but he also shows a tracing of a case, in which an auricular venous pulse is present, which he attributes to stimuli arising nearer the sinus, thus reaching the auricle before the ventricle. Mackenzie⁵ shows similar tracings from cases subject to irregular paroxysmal attacks of increased frequency of the heart, but as he considers the essential feature of paroxysmal tachycardia to be the presence of the nodal rhythm, he describes the cases showing an auricular venous pulse under palpitation.

¹ *Quar. Jour. Med.*, 1908, Vol. I., p. 484.

² *Edin. Med. Jour.*, 1907.

³ *Johns Hopkins Hospital Bull.*, Oct. 1906, p. 337.

⁴ *Amer. Jour. Med. Sciences*, 1907.

⁵ Mackenzie, *Diseases of the Heart*, p. 130.

He further states that in those cases showing the auricular venous pulse, the rate rarely exceeds 170 beats a minute and that, except for the presence of an occasional extra-systole, the rhythm is regular. In Schmoll's case the rate was between 140 and 180 per minute and the pulse absolutely regular.

From these observations, we are justified in concluding that, during an attack of paroxysmal tachycardia, the normal rhythm of the heart undergoes a profound modification, since both auricles and ventricles cease to respond to the normal automatic stimuli originating in the sinus node of Keith and Flack, but, in place of those, they respond to an increased number of stimuli originating in the auriculo-ventricular bundle, or the auriculo-ventricular node of Tawara.

In the present state of our physiological knowledge, it is impossible to definitely state under what conditions the point of origin of the stimulus changes from the venous sinus to the atrio-ventricular bundle. Whether such a change can arise from purely nervous influences, through the vagus, or accelerators, or both combined, or through direct stimulation from inflammatory or degenerative processes of the heart muscle, or again through the mechanical result of acute dilatation, awaits further investigation.

We may, however, recognise clinically several distinct conditions in which attacks of paroxysmal tachycardia arise:— (I.) Cases occurring in patients with previously damaged hearts; (II.) Cases of apparently purely functional character; (III.) Cases in patients affected with central nervous lesions.

Schmoll also recognises a fourth group in patients affected by dysthyreosis. When, however, we consider the extreme rarity of attacks presenting the features of paroxysmal tachycardia in cases of Graves' disease, on the one hand, and the occasional development of organic changes in the heart during the course of the disease, and the demonstration of lesions in the central nervous system, such as hæmorrhages in the medulla oblongata, on the other; it seems inadvisable, in the present state of our knowledge, to erect a separate group for those cases. Venous pulse tracings of the usual rapid pulse of exophthalmic goitre show the normal auricular rhythm.

Bouveret was the first to separate the attacks of tachycardia, occurring in patients the subjects of organic cardiac

disease, from the so-called functional cases arising in patients whose hearts are apparently sound. In this he has not been followed by many of the subsequent writers on the subject. Herringham can see no essential difference in the two classes, and considers the tachycardia a symptom and not a disease. Hay also sees no reason for separating them. A number of writers consider that the suddenness of the onset and cessation, and comparatively slight disturbance caused by it, point to its being a functional condition. Yet others, that the comparative rarity of the attacks of paroxysmal tachycardia, in cases of organic heart disease, indicate that the one condition is independent of the other. The comparative rarity and paroxysmal character of the attacks certainly cannot be considered as in any way incompatible with a local origin of the attacks. The same rarity and paroxysmal character is met with in Stokes Adam's Syndrome, in which the evidence is conclusive that the condition is in most cases due to a local lesion depressing the conductivity of the auriculo-ventricular bundle. The sudden onset and abrupt conclusion of the attack cannot, I think, be urged against its cardiac origin, for it is difficult to avoid the conclusion that, in Mackenzie's case, for example, in whom the attacks were at first paroxysmal and later became permanent, and in whose heart Keith was able to demonstrate, post-mortem, an endarteritis obliterating the artery supplying the auriculo-ventricular bundle, with patches of fibrous tissue affecting the muscle wall of the heart and the remains of the primitive cardiac tissue, the local disease was the cause of the condition. Further, the occurrence of typical paroxysmal attacks during the convalescence from the specific fevers, such as typhoid and diphtheria, and the demonstration of extensive myocardial changes in a considerable proportion of the cases which have come to autopsy, all point to the importance of the local changes in the heart in the ætiology of at least some of the cases.

When, however, we compare the clinical histories of some of those cases, such, for instance, as Fräntzel's¹ in a male, aged 35, who, for three months before death, suffered from paroxysmal attacks of palpitation and breathlessness, and in whom, post-mortem, a patch of recent fibrosis, deep red in colour,

¹ *Deut. med. Woch.*, 1891, Bd. 17, 8, 321.

was found in the left ventricle ; or, again, Fränkel's case¹ in a male, aged 30, in whom a year before death typical attacks of paroxysmal tachycardia occurred, and in whom marked degeneration of the myocardium was demonstrated, or Mackenzie's² case in whom for five years before death attacks of tachycardia occurred, and in whom an obliteration of the lumen of the artery supplying the A.V. bundle was found, with the case of Traves Smith's, in a girl, aged 13, associated with attacks of epilepsy, both conditions being markedly influenced by bromides, it is evident that there are very great differences between the two types of cases. As already shown, in many cases, the symptoms are not limited to the circulatory system. In not a few, the attacks are preceded by gastric symptoms. In Moon's case, the attack was frequently preceded by marked weakness of voice. In Tuczek's, Honningham's and Kredel's cases, the attacks were accompanied by a condition of acute emphysema. Aphonia and gastric distress would readily enough be explicable by an organic or functional disturbance of the vagus. Whether or no an acute and transient emphysema can arise from a vagal neurosis is at present an undecided point. The removal of the influence of the vagi by freezing the nerve invariably leads to an increase in the force and duration of the inspiratory contraction, and the expiratory relaxations are incomplete.³ Ziertmann⁴ explains the occurrence of an acute distension of the lungs, in conditions of terror in the insane, as the effect of central irritation of the vagus in the medulla oblongata.

Numerous attempts have been made to explain paroxysmal tachycardia from a nervous basis. Bouveret and Hochhaus⁵ consider that the majority of the cases are due to a periodic vagus paralysis. Hoffmann believes that the irritability, conductivity, and contractibility of the heart muscle are increased through nervous influences arising in the medulla oblongata, and that, in consequence, the heart responds to abnormal stimulations. He considers the attack an epileptic manifestation. Talamon also considers the condition closely related to

¹ *Charite Ann. Berlin*, 1878, Bd. V., p. 273.

² Mackenzie, *Diseases of the Heart*, p. 315.

³ Schäfer's *Physiology*, Vol. II., p. 297.

⁴ *Munch. med. Woch.*, 1894, 38 and 39.

⁵ *Arch. f. klin. Med.*, Bd. 51, p. 24.

epilepsy. Schmoll, from whose article I have largely drawn, gives the classification adopted here, with the exception that he includes under a special group the cases occurring in patients with dysthyreosis. Wenckebach¹ considers that it is proved that it is impossible to set up extra systoles in the heart from the nervous system directly, and suggests that the stimulation of the central nervous system results in a great increase of the chronotropic (increased number of automatic stimuli) and bathmotrophic (increased irritability) influences on the heart. Mackenzie² finds that the stimulations, which produce extra systoles, may occur under two main conditions, first, in people in whom there appears to be no organic change in the tissues, as in the young, and to those in whom extra systoles appear at intervals, and finally disappear; and second, in people of mature years, in whom it is found associated with sclerotic changes in the heart muscle. That direct irritation from organic changes in the heart can initiate a nodal rhythm is strongly suggested by several cases observed by Mackenzie. In one the occurrence of extra systoles was followed later by the nodal rhythm, and finally by typical heart block. One must infer that a condition of increased irritability was first set up, to be followed later by diminished conductivity. In five other cases of nodal rhythm observed by Mackenzie,³ Keith found changes in the primitive cardiac tube. In two of them there were, during life, attacks of typical paroxysmal tachycardia. Mackenzie considers that inflammatory deposits on or near the A.V. bundle first impair its functioning as shown by the delay which occurs between the contraction of the auricle and the ventricle from the retarded transmission of the impulse through the connecting fibres, and that later cicatrization may irritate the bundle and render it more excitable than the sinus, in which case the contraction of the heart originates at this most excitable part. Hay suggests that nervous impulses, unable in themselves to excite extra systoles, so alter the condition of the heart muscle, and more especially the fibres joining the auricles and ventricles, that they are rendered more excitable, and also much more capable of

¹ *Arrhythmia of the Heart*, p. 175.

² *Quar. Jour. Med.*, 1908, Vol. I., p. 483.

³ *Diseases of the Heart*, p. 162.

stimulus production. He states that the determining factor of the paroxysm is then some cause which affects those fibres, and initiates the abnormal cardiac rhythm, and he considers that the most common factor is physical strain.

I have attempted to show that under the name paroxysmal tachycardia, we have at least two types of cases in which the actual attack of heart hurry in so far as its sudden inception and sudden cessation of the nodal rhythm is concerned, appears to be identical, but the accompanying phenomena are somewhat different. In the one we have the attacks coming on in an apparently normal heart, frequently at an early age, and either continuing through a long and busy life, or sometimes permanently ceasing. In addition to the heart symptoms, we have, in many cases, changes pointing to an involvement of various functions of the vagus, and in a few the occurrence of definite epilepsy, both the tachycardiac and epileptic attacks being markedly influenced by the administration of bromides. Finally, we have in certain cases the post-mortem demonstration of lesions in the medulla oblongata and vagus. In the second class we have, so far as the heart is concerned, apparently identical attacks, occurring in, most frequently, the subjects of old rheumatic heart disease. These attacks, however, as a rule, appear at a much later age, are limited to changes in the circulatory system, are uninfluenced by bromide treatment, and generally terminate fatally within a comparatively short time. Post-mortem changes in the primitive cardiac tissue can be demonstrated in the large majority of the cases examined.

Therefore, it would appear that the increased irritability of the primitive cardiac tissue, which seems to be the cause of the inception of the nodal rhythm, may arise in two quite different ways:—

I. As Hay, Hoffmann, and others suggest, as a result of functional and organic changes in the medulla oblongata and vagus, and in which the actual exciting cause of the attack is most frequently some sudden strain, and

II. As a result of direct irritation from organic changes in the neighbourhood of the primitive cardiac tissue.


It is in this dual source of the increased irritability that I think the necessity lies for a differentiation of the cases into

those with, and those without, concomitant cardiac disease.

In addition to both these classes, we have cases of paroxysmal heart hurry, showing an auricular venous pulse, which Mackenzie considers should not be included under the term paroxysmal tachycardia. In the absence of pulse tracings it is impossible to accurately separate those cases from those recorded as paroxysmal tachycardia, but Mackenzie admits that the most striking instances recorded in the literature are undoubtedly due to the sudden inception of the nodal rhythm. He states that cases with the auricular venous pulse rarely exceed a pulse rate of over 170 beats a minute, and that the pulse is always regular except for an occasional extra systole.

Whether the functional cases are to be considered as a manifestation of epilepsy, as suggested by Hoffmann, Talamon, and others, or as a periodic vagus paralysis, as suggested by Bouveret and Hochhaus, must at present remain undecided. It is of interest to note that Sir William Gowers¹ has recently shown the close connection between epilepsy and certain attacks of an entirely different character from those at present considered, but attributed by him to a vagal neurosis.

¹ *Lancet*, 1907, p. 1552.



INJURIES TO HAND WITH RELATION TO INSURANCE.

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THE EFFECT OF INJURIES, LOSS, OR IMPAIRMENT OF PART OF THE HAND, OR OF THE HAND AS A WHOLE, CONSIDERED WITH RELATION TO INSURANCE AND COMPENSATION.

IN working out these tables and statistics, I have consulted the indemnity rates of many of the trades unions, and compared them. On this comparison, along with a knowledge of the wage-earning capacity of many of my own cases, I have based my opinions. But these tables are not supposed to be absolute; far from it, for, in many cases, the fingers are of different value, according to the trade of the patient.

For example, I have classed the index finger at a higher rate than the middle finger, and taken that view as a general one. Yet, in the case of a cotton operative, *i.e.*, the piecer—a class with whom I have had a great deal of experience—that rating will not hold. It is the middle finger of the left hand that is the all-important one for piecing. So that a slight alteration can be made to meet every trade, and every individual case. My whole aim was to act as a guide to the estimation of compensation, which has now become a very important factor both to employer and employed.

Again, there are cases in which, in skilled mechanics and engineers, the loss or impairment of one or more fingers incapacitates them from following the trade to which they were trained, and, accordingly, I think that, in all fairness, such cases ought to be rated as equal to three-fourths loss of the whole hand.

Again came the difficulty as regards the rating of the two hands, some saying they ought to be rated alike, and, after due consideration, I have come to the conclusion to rate the right hand higher than the left, making exception only in the case of left-handed individuals, and certain special occupations.

Reidinger disputes the justice of this, claiming that the special work performed by the left hand deserves equal

consideration, and accordingly he rates both hands alike, although he admits the impossibility of overcoming the deep-rooted prejudice in favour of the right hand, all at once.

I have made my calculations for the hand only, and have taken into consideration, in the treatment of this subject, the parts below the radio-carpal articulation.

Starting, therefore, at that point, I consider loss of the hand below that joint, or at that joint, at 100 per cent. in case of the right hand, and 75 per cent. in case of the left. The percentages are to be taken of the value laid down for the hand by the insurance companies, etc., and calculated according to the wage-earning capacity of the individual. Loss, or impairment of the hand, below the carpo-metacarpal joint, I calculate at 80 per cent. in the case of the right; 60 per cent. in the case of the left. Loss of the thumb (right hand) I put at 25 per cent.; left hand 20 per cent.; and, in the case of a skilled mechanic, who is incapacitated from his trade, 30 per cent. right hand; 25 per cent. left hand—the hand proper being all the time intact.

When the hand proper is affected, I allow 35 per cent. for the loss of the thumb, right hand, and 30 per cent. for loss of thumb, left hand. The loss of one phalanx of the thumb I consider equal to half loss of entire thumb. With the hand proper intact, loss of the right index finger I compute at 20 per cent. Loss of the left, 15 per cent. When, however, the hand proper is affected, I put the index at 25 per cent. in the case of the right; and 20 per cent. in the case of the left, while I hold that disarticulation of the finger impairs the usefulness of the hand to a greater extent than amputation through the proximal phalanx.

The middle finger has caused a great deal of dispute as regards its relative value. In the case of cotton operatives, *i.e.*, piecers, I rate the middle finger, left hand, equal to the index left. With the hand intact, the middle finger, right hand, is, in ordinary circumstances, rated at 16 per cent., and the left at 10 per cent.; while, if the hand as a whole is affected, here the affection is usually as bad as in the case of the index being affected, and so 25 per cent. is allowed in the case of the right, and 20 per cent. in the case of the left.

The ring finger, I find, is by most rated very low; in fact lowest of all the fingers. With the hand intact, in the

case of the right, 10 per cent. being allowed, and in the case of the left, 5 per cent., while, as in the case of the middle finger if the hand proper is affected, it is so to an extent requiring 25 per cent. compensation in the case of the right, and 20 per cent. in the case of the left.

In the case of the little finger, the compensation rises again, being computed at 14 per cent. right, hand intact; 10 per cent. left, hand intact; while, if the hand as a whole is affected, the rating goes up, but not so much, *i.e.*, 20 per cent. right hand; 15 per cent. left.

In estimating the allowance for stiffness of a finger, the loss of the functional power of the adjacent fingers must be taken into consideration. If only the metacarpo-phalangeal joint is stiff, and the other fingers not affected, the injury should be rated at two-thirds of the entire finger; while, on the other hand, I think that for a completely ankylosed, or paralysed finger, the rate should be higher than for the complete loss of a finger, since it is constantly in danger of being hit, and injured.

The thumb, even if completely ankylosed, may be quite useful, as it retains its power of apposition, and so should be rated at only $\frac{1}{4}$ of the rate for the loss of the thumb, the rest of the hand being intact. Stiffness of a distal phalanx does not limit the usefulness of the hand, and, so, is rated very low—2 per cent. up to 5 per cent.

If one-third of the finger is lost, its usefulness is only slightly impaired; if more than two-thirds are lost the rate equals that for loss of the entire finger.

As regards the different rates for the different fingers, J. Reidinger, in 1897, read a paper at Brunswick, at a meeting of the chief German physicians, proposing a basis for the estimation of indemnities, for which he adduced physiological and practical reasons.

A summary of the results he obtained is as follows:—

The usefulness of the human hand depends less on its strength than on the harmonious action of all the fingers, and, accordingly, he considers it unreasonable to differentiate between them in respect to indemnity, except in special cases and in the case of the thumb. The middle finger he considers the strongest, a fact which, he says, is very evident when it is lost. But the index finger directs the action of the other

fingers, and has also in it the tactile sensation most highly developed. Its relative value, therefore, according to him, equals that of the middle finger.

The little finger forms the lateral termination of the row of fingers, just as the ball of the little finger forms the boundary of the hand. Accordingly, if the little finger is removed, the muscles of the ball of the little finger undergo considerable atrophy. In order to exert any strength, however, the little finger must act in unison with the ring finger.

Because of the close relation, and interdependence of the fingers, Reidinger says that the loss of any one of the other fingers should be, in some respects, and in certain circumstances, rated higher than the loss of the index. However, I think that each finger has its own specific value, apart from its relation to the others, and so, in my calculations, I have made allowance for the others being affected, by drawing up two sets of tables—one where the hand proper is intact, the other where the hand proper is impaired by the loss, or injury to the specified part. Again, the more of the metacarpal that is removed, the more will the loss be felt by the hand. I shall now turn to the consideration of the loss of more than one finger as affecting the hand, and shall confine my grouping to cases that commonly occur, *i.e.*, where the fingers lying side by side are damaged.

With the hand proper, intact, loss of the thumb and index finger of right hand is calculated at 40 per cent.; of left hand at 30 per cent. With the hand proper affected, loss of the index and thumb of right hand is put at 50 per cent.; of left hand at 40 per cent.

With the hand proper intact, loss of the ring finger and little finger of right hand, 25 per cent.; left hand 20 per cent.; with the hand proper affected, right hand 40 per cent.; left hand 30 per cent.

In the case of the index, and middle finger, with the hand intact, the right hand is calculated at 35 per cent.; the left at 25 per cent.; with the hand proper affected, the right at 40 per cent.; the left at 30 per cent.

In the case of loss of middle and ring finger of right hand, the hand proper being intact, the indemnity would be 30 per cent.; in the case of the left hand 25 per cent.; while, should the hand be impaired (and, as a matter of fact, we very often

find that here it is extensively impaired), the indemnity rises to 45 per cent. in case of right hand, and 40 per cent. in the case of the left.

Take now, more extensive losses to the hand as, for example, where three adjacent fingers are damaged; the indemnity here rises considerably. Loss of the thumb, index and middle fingers, the rest of the hand being intact, would mean 55 per cent. for right hand, and 40 per cent. for left. With the hand impaired, however, 70 per cent. would be reckoned for the right, and 55 per cent. for the left. Loss of the middle, ring, and little finger, the hand proper being intact, would be put at 50 per cent. for the right, and 40 per cent. for the left; but with the hand impaired, 60 per cent. for the right, and 50 per cent. for the left.

With the hand proper intact, loss of the middle index and ring finger is put at 45 per cent. for the right hand, and 35 per cent. for the left; with the hand proper affected, 55 per cent. for the right, and 45 per cent. for the left.

For loss of all four fingers, the thumb alone remaining, and rest of hand intact, in the case of right hand, compensation is reckoned at 55 per cent., in the case of the left hand at 45 per cent.; but, if the rest of the hand is affected, at 65 per cent. for the right hand, and 55 per cent. for the left.

Loss of all the fingers, metacarpals intact, is put at 75 per cent. for right hand, and 55 per cent. for left; loss below the metacarpo-phalangeal joint 80 per cent. for the right hand, and 60 per cent. for the left; loss at the radio-carpal joint 100 per cent. for right, and 60 per cent. for the left.

Again, turning to impairment due to contractions, if the contraction of the finger has gone so far as to bring the end of the finger into contact with the palm of the hand, it disables the whole hand for working purposes; while, if the contraction is less far advanced, and the hand can be used for taking hold of objects, there may be no loss of working power. The most unfavourable results of contraction are seen when the metacarpo-phalangeal joint is affected. Contraction at the mid-phalangeal joint ranks second in this respect; while a contraction of the distal-phalangeal joint does not restrict the working power of the hand at all.

I append table, showing at a glance, the scales of indemnity

already worked out.

THE REMAINDER OF THE HAND BEING INTACT.

Right Hand.		Left Hand.	
Thumb -	- 25°/100	Thumb -	- 20°/100
Index -	- 20°/100	Index -	- 15°/100
Middle -	- 16°/100	Middle -	- 10°/100
Ring -	- 10°/100	Ring -	- 5°/100
Little finger -	- 14°/100	Little finger -	- 10°/100
$\left. \begin{array}{l} 55^\circ/100 \\ 45^\circ/100 \\ 50^\circ/100 \end{array} \right\} 75^\circ/100$		$\left. \begin{array}{l} 30^\circ/100 \\ 25^\circ/100 \\ 25^\circ/100 \\ 20^\circ/100 \end{array} \right\} 40^\circ/100$ $\left. \begin{array}{l} 35^\circ/100 \\ 45^\circ/100 \end{array} \right\} 55^\circ/100$	

THE REMAINDER OF THE HAND BEING IMPAIRED.

Right Hand.		Left Hand.	
Thumb -	- 35°/100	Thumb -	- 30°/100
Index -	- 25°/100	Index -	- 20°/100
Middle -	- 25°/100	Middle -	- 20°/100
Ring -	- 25°/100	Ring -	- 20°/100
Little finger -	- 20°/100	Little finger -	- 15°/100
$\left. \begin{array}{l} 70^\circ/100 \\ 55^\circ/100 \\ 60^\circ/100 \end{array} \right\} 80^\circ/100$		$\left. \begin{array}{l} 40^\circ/100 \\ 30^\circ/100 \\ 40^\circ/100 \\ 30^\circ/100 \end{array} \right\} 55^\circ/100$ $\left. \begin{array}{l} 45^\circ/100 \\ 40^\circ/100 \end{array} \right\} 60^\circ/100$	

NOTES FROM FOREIGN JOURNALS.

APPENDICITIS IN SCARLATINA.

The appendix, by virtue of being an organ of lymphoid structure, can be affected in the course of a general inflammation in the same way, and for the same reason, as a lymphoid gland. Consequently, the appendix presents, in scarlatina, constant lesions, which can be easily traced in an autopsy. The small lesion is characterised by vascularisation of the appendix, and especially by the presence of much-swollen glands in the mesentery. Microscopically, an intense folliculitis, with peri-adenitis, is revealed. In effect, the appendix behaves exactly like a tonsil. Clinical examination can confirm this appendicular complication. Kauffmann considers that the vomiting, in the early stage of scarlatina, is frequently associated with an inflamed appendix. Be that as it may, appendicitis can show itself at two periods in the course of an attack of scarlet fever; in the stage of high fever, and during convalescence. In the former, it is a matter of a rare complication, which often passes unnoticed. The symptoms specially pointing to it are repeated vomiting, pain in the right iliac fossa, and rigidity of the abdominal wall over that region. As a rule these cases cause a grave prognosis, and may end by peritonitis due to perforation.

The appendicitis of the convalescent and apyrexia stage is, if not more frequent, at least easier to recognise than during the earlier stage of the disease. At this time, all the forms of appendicitis can be observed, from a slight colic up to the most serious peritonitis. This is not all; scarlatina does not confine itself only to these acute attacks; it may leave behind it lesions of chronic appendicitis, which explain the acute attacks subsequently observed. Kauffmann is of opinion that many of the ordinary class of attacks are, in fact, post-scarlatinal. It is useful to know these ideas. A serious case of scarlatina may often hide an appendicitis, of such kind that the treatment of the scarlatina could derive great benefit by being brought into line with that of the appendicitis. Absolute rest, with dieting and ice to the abdomen, appears to Kauffmann to give better results than the classical treatment by baths and purgatives. On the other hand, scarlatina should in no way influence the treatment of a downright appendicitis. Surgical intervention is the only treatment for appendicitis with generalised peritonitis, even in the febrile stage of scarlatina. The other forms are amenable to treatment by methods ranging from alert expectancy to icebags. Lastly, after an attack of scarlet-fever, it is always necessary to pay attention to the state of the bowels, and to prescribe a diet both nourishing and laxative, in order to avoid in the future a possible outbreak of appendicitis.—(*Journal des Praticiens*.)

PRIMARY DIPHThERIA OF THE CONJUNCTIVA.

Cases of primary diphtheritic affection of the conjunctiva are exceedingly rare, and extremely difficult to diagnose. Montagnon reports a case, in which the patch, localised on the ciliary border, looked like a sty. Simple treatment only led to another patch of false membrane on the upper lid. At the same time, oedema spread to the face and neck, and the glands were swollen. No rise of temperature was occasioned. Diagnosis was at last obtained by bacteriological examination. Thirty-six hours after the

injection of anti-diphtheritic serum, the false membranes began to dissolve, and the œdema of the conjunctiva and lid grew less. Three days later the disease was completely checked. The author adds a reminder that, in these cases of conjunctival diphtheria, on one side, the necessity for protecting the other eye must not be forgotten, because of the ease of inoculation, especially in children.—(*La Loire Médicale*.)

ACTION OF SCOPOLAMINE ON TREMOR OF DIFFERENT KINDS.

Parisot has tried the effect of scopolamine upon tremors of other kinds than paralysis agitans in which it has proved so successful. In all his cases, he has made use of the hydrobromide of scopolamine in doses of $\frac{1}{4}$ to $\frac{1}{2}$ m.g. (gr. $\frac{1}{256}$ th to $\frac{1}{128}$ th), never exceeding $\frac{3}{4}$ m.g., given in a daily hypodermic injection. After 10 days' treatment, the administration is stopped for 4 days and then recontinued. The susceptibility of the patient to the drug is first ascertained by small doses.

In Parkinson's disease (paralysis agitans), the drug produced considerable decrease in all the cases, and a total disappearance in 11 out of 14 cases treated. In every case, when the administration is stopped, the tremor remains much less for some days. In no case has a cure been obtained. The freedom from tremor persists for from 10 to 16 hours after the injection.

In senile tremor, the action of scopolamine is almost as pronounced as in the preceding. The effect is kept up from four to six hours at the least.

In the tremors of Graves' disease, the action was less marked. If the tremors decreased in intensity they reappeared at the least emotion. Its action is, therefore, not nearly so lasting, or so considerable, as treatment directed to the general symptoms of exophthalmic goitre.

In three cases of hereditary tremor, great improvement was obtained. This lasted on the average for eight hours, but required a dose of $\frac{1}{2}$ to $\frac{3}{4}$ m.g.

Hardly any effect was noticed upon the tremors of general paralysis. These, however, are not oscillations of any size. Alcoholic tremors are decreased by the drug. After three weeks' treatment, a patient, of 34 years of age, stopped trembling, but six days after the drug had been stopped the tremors returned in their former intensity. Scopolamine has lessened the tremor in insular sclerosis, and, at the same time, the ataxia and the rigidity were improved. The action lasted for from 20 to 26 hours after the injection.—(*Revue de Thérapeutique médico-chirurgicale*.)

TREATMENT OF INOPERABLE CANCER OF THE UTERUS BY ACETONE.

Hurst Maier reports favourably on his experience of this treatment, suggested by Gellhorn, which consists in the methodical application of acetone. Its application to this class of case was suggested by its use in laboratory work as a hardening agent in preparing tissues for microscopical sections. It is intensely hygroscopic, so that tissues shrink and harden under its influence very quickly. Gellhorn's idea was to harden the ulcerating surface of the cancer *in vivo*, thereby checking the discharge until the escharotic portion was cast off. The resulting free surface could then again be hardened. After a preliminary curetting, the fresh surface is carefully dried, and from one half to one ounce of acetone is poured into the wound through a Ferguson's speculum. The pelvis of the patient must be raised for this purpose, as in the Trendelenburg position. The patient remains

in this position for from 15 to 20 minutes, and the acetone is then allowed to run out through the speculum by lowering the pelvis of the patient. The cavity is packed with a narrow gauze strip soaked in acetone. The healthy surfaces of the vagina and vulva are cleaned with sterile water and dried. Beginning four or five days after this operation, regular treatment is instituted by applying the acetone two or three times a week. No anæsthetic is necessary, and the treatment can be carried out at the patient's home, or even in the consulting room. The pelvis is raised, and the Ferguson is inserted into the cavity and filled with acetone. It is held in place for half an hour and then emptied, as described above. The immediate effects are:—Any slight oozing is checked almost instantly; the surface of the crater is covered with a thin whitish film—light brown, if any blood is extravasated. The normal vagina is not appreciably irritated. On the vulva and the skin an excess of acetone produces a faint white patch, which soon disappears. No pain accompanies the cauterisation. The good effects are shown almost at once. There is no return of the hæmorrhage; the discharge ceases; the patient no longer lives in a foul atmosphere, and the system is no longer subjected to the drain of loss of blood and of discharge. The appetite returns and the patient rapidly improves in health. Pain is neither increased nor diminished, but can be controlled by aspirin.—(*Therapeutic Gazette.*)

MOSER'S SERUM AS A REMEDY IN SCARLATINA.

Egis and Langorsy devoted particular attention to the effects of this serum when used on the scarlatina patients in the Children's Hospitals of St. Vladimir and Morosow, at Moscow, for a period of two years. On the grounds of their careful observations, they have come to the following conclusions:—

- (1) In the treatment of severe cases with Moser's serum, the mortality falls from 47·4 per cent. to 16·1 per cent.
- (2) The serum possesses an antitoxic effect to a high degree.
- (3) Its influence upon the complications of scarlatina is insignificant.
- (4) The serum must be injected in the course of the first three days of the disease—on the fourth day at the very latest.
- (5) The earlier the serum is injected, so much the more quickly does the fall of the temperature ensue. The fall takes place more quickly in simple than in complicated cases.
- (6) The method of dosage adopted was 200 cc. injected at one time, except in the case of the youngest children, for whom an injection of 100 to 150 cc. was sufficient.
- (7) The individuality of the horse has a great influence upon the value of the serum; consequently, a serum may be more or less effective.
- (8) In cases of mixed infection of scarlatina and diphtheria, the simultaneous injection of Moser's serum and diphtheria antitoxin produces a marked effect, although it is not so noticeable as in uncomplicated scarlatina.
- (9) Prophylactic injections, made with small doses, confirm Moser's results.
- (10) On the negative side, are the frequency and the gravity of the serum complications, owing to the large amount of serum employed.—(*Jahrb. f. Kinderheilkund.*)

Reviews of Books.

A Manual for Midwives. By C. NEPEAN LONGRIDGE, M.D., F.R.C.S., M.R.C.P. London: J. & A. Churchill. 3s. 6d. net.

THE author states, in his preface, that this little book has been designed for midwives, and that he has aimed at lucidity and briefness. He has attempted the somewhat difficult task of putting the scientific theories and facts of midwifery into a form which can be readily understood by a class of readers, the large majority of whom have not even had the advantage of a nurse's training to enable their minds to grasp elementary scientific principles. He has succeeded admirably, for he excels in apt similes and lucid explanations. The book is written in an eminently readable style, though sometimes the author has indulged in the use of too exuberant metaphor. Such difficult conceptions as "retraction of the uterus" and "separation of the placenta," to mention only two, are explained and illustrated with an aptness which cannot fail to bring understanding to the most uninitiated.

As regards main principles, the book is sound. The midwife is thoroughly impressed with the principles of asepsis, which are insisted upon again and again in almost every chapter. We are glad the author recommends that no lubricant should be used for vaginal examination during labour; he rightly lays very little stress on vaginal examination, first, because it involves risks of sepsis, and, secondly, because it does not give such trustworthy information as carefully performed abdominal palpation affords. The rules for the conduct of the third stage of labour, and the management of breech-presentations are particularly good.

The faults of the book are mainly those of omission. The signs and symptoms of pregnancy lack accurate detail; no mention is made of the date at which the foetal heart sounds may first be heard; the date of viability of the child is omitted. Obstructed labour is not clearly defined, and no practical distinction is made between "obstructed" and "prolonged" labour; we do not agree that rigid perinæum and persistent occipito-posterior presentations are causes of "obstructed" labour. The causes of post-partum hæmorrhage are given as atonic and from laceration, but no mention is made of hæmorrhage, due to imperfect retraction of the uterus from mechanical causes, such as retraction of a piece of placenta or membranes. In puerperal thrombosis of the femoral vein, no mention is made of pain in the affected leg, which is surely one of the first symptoms to attract both patient and nurse. In puerperal insanity, no mention is made of the sleeplessness, which is usually the first danger signal. It is surely unwise to tell a midwife to give a baby "a little grey powder," without defining the dose of this not altogether innocuous drug. The author is to be greatly congratulated on including a chapter on Cancer of the Uterus. We consider this to be one of the main features of the book. The opportunity which a midwife has of detecting the disease in its early stages cannot be over-estimated, for she comes into confidential relationship with a large class of poor women.

The book fulfils all the requirements of the examination of the Central

Midwives' Board, and is somewhat cheaper than its rivals in the same field. In the next edition, which deserves to appear soon, the author will doubtless correct the few faults to which we have called attention.

Primary Nursing Technique for First Year Pupil Nurses. By ISABEL McISAAC, Graduate of the Illinois Training School for Nurses; formerly Superintendent of the Illinois Training School for Nurses; Hon. Member of the British Matrons' Council; Charter Member of the Nurses' Associated Alumnae of the United States; Member of the American Society of Superintendents of Training Schools for Nurses; a Director of the American Journal of Nursing; a Trustee of Mercy Hospital, Benton Harbor, Michigan. London: Macmillan & Co. 3s. net.

THE New York State Education Department and various authorities put forth curricula for preliminary courses for nurses, thereby making it "necessary to give pupils a considerable amount of teaching in nursing technique before they are entrusted with the care of patients." All teaching is to be in "relation to nursing and not to medical practice."

It is to meet this need that Miss McIsaac has compiled the very useful little book now before us. It will be quite as valuable to English nurses, and useful alike to students and teachers in the nursing profession and is excellently arranged. The preface is for teachers, and outlines a scheme for demonstrations to nurses. After that, personal and ward hygiene is briefly dealt with in the early chapters, while disinfection and aseptic technique form the conclusion of the book. The intermediate chapters discuss ward-work and various nursing duties. Chapter VII., dealing with medicines, is particularly useful and interesting, beginning as it does with the order and care required in arranging the medicine cupboard, and going on to the importance of an accurate knowledge of dosage, properties of drugs, their actions, and methods of giving them. Books of reference for reading and teaching are recommended in many places.

Hygiene of Nerves and Mind in Health and Disease. By AUGUST FOREL M.D. Translated from the German by Austin Aikins, Ph.D. London: John Murray. 6s. net.

THIS book is from the pen of Professor Forel, who, as a Psychologist, especially in the fields of instinct and hypnotism, has achieved a world-wide reputation, and, as a volume of The Progressive Science Series, is intended for the use of intelligent laymen as well as for the members of the profession. Indeed its scope and object may be gathered from a sentence in the Author's Preface, in which he says: "My conception of popular hygiene is that it enables an intelligent layman, with a fair education, to govern his life in such a way as to avoid diseases and abnormalities, as far as possible for himself, his fellow men, and his offspring, and to promote the health and strength of them all in every respect." We have no hesitation in saying that, if every intelligent layman would study Part III. of the work, and carefully follow its teaching, his own well-being and that of his successors would be materially enhanced. Notwithstanding the care of the translator, and his occasional helpful

notes, we fear that Part I. "Mind, Brain and Nerves in their Normal Condition," and Part II. "Pathology of the Nervous Life," are too technical for the ordinarily intelligent layman. They will doubtless be read with interest and, possibly, illumination by the scientist.

The principle underlying the whole of the work is that brain and mind are identical, in short, that the Brain is the man, and the description of mental processes is clear and loftily conceived, though we doubt whether the account of the functions of "conscience" will meet with general acceptance. The anatomy of the nervous system is concise and clear, and it is interesting to note, in this connection, that it is "probable that an old man's neurones are the very same ones that he had at birth." The discussion on the relation of mind and brain, and their identity, leading easily to a monistic conception of the world, will, in all probability, excite opposition in the minds of many readers.

In the discussion on Embryology and Race History, we are inclined to think that the author lays too much stress upon the influence of heredity, and too little on the influence of education, though this fault is largely atoned for by the admirable teaching of Part III. As an introduction to it, we commend to our readers the sentence: "It is false to believe that we have to learn only in youth; we have never finished," and for the information of the modern socialist, we will quote "A good citizen is the one who gives more to his fatherland and mankind than he gets from them, while a bad citizen does the opposite." The limits of our space forbid further incursions, but we have possibly said enough to convey a good idea of this excellent book, and to whet the appetite of our readers.

That the translator has not had an easy task may be gathered from an awkward sentence, which is unfortunately not a solitary example. "He who has little talent of any sort should not force himself through vanity to try and conquer unattainable fields." When will writers cease to use such expressions as "try and conquer," and "try and make," and when will they learn the correct meaning of "attain"?

The Prevention of Infectious Diseases. By JOHN C. McVAIL, M.D., D.P.H., F.R.S.E., County Medical Officer of Health for Stirlingshire and Dumbartonshire. London: Macmillan & Co. 8s. 6d.

THIS volume consists of the Lane Lectures (revised for publication), delivered by Dr. McVail at the Cooper College, San Francisco. The diseases dealt with are limited to the ordinary list of infectious diseases, whose control is more or less thoroughly attempted by public health authorities; viz.:—typhus fever, enteric fever, plague, measles, scarlet-fever, diphtheria, small-pox, and tuberculosis. Whooping-cough is not included, because it hardly yet comes into that category. A chapter is also devoted to a description of the "Public Health Organisation in Britain." Dr. McVail has treated his subject with much erudition, and much enthusiasm, freely referring to his own extensive experiences. The book is well printed and amply illustrated. It is written in a graceful and flowing style, which renders it as interesting as it is instructive. It shows the large part played by Britain in the history of sanitary reforms and in the prevention of infectious disease in the past, and indicates the need for further improvement in the future.

Practical Sanitation. By GEGRGE REID, M.D., D.P.H. Pp. xii + 352.
London: Chas. Griffin & Co., Ltd. 6s.

THIS work, which is intended primarily for sanitary inspectors, is an admirable and up-to-date summary of the main features of practical sanitation. Dr. Reid's wide experience of sanitary matters qualifies him to speak with authority on all things concerning the work of the sanitary inspector, and the all-round excellence of this book forbids anything but praise. In the section on disinfectants, a slip has evidently been made in classing chinolol among efficient disinfectants. Recent work has shown that, compared with carbolic acid, its value, as determined by the Rideal-Walker test, is only 0·3. The sections on Sewage Disposal, Sewerage and Drainage, Plumbers' Work, and Infection and Disinfection are especially good. The illustrations are clear, the print is good, and altogether the book is well turned out. An appendix, containing the principal statutes affecting the inspector of nuisances, is admirably written by Dr. Herbert Manley, Barrister-at-Law.

Nature's Hygiene and Sanitary Chemistry, containing also a special account of the Chemical and Hygienic characters of Eucalyptus, Pine, and Camphor Forests, and some industries connected therewith. By C. T. KINGZETT F.I.C., F.C.S., Past Vice-President, Society of Public Analysis Hon. Member, Société Française D'Hygiène. Fifth edition, pp. xvi + 527. Demy 8vo. London: Baillière, Tindall & Cox. 7s. 6d. net.

THIRTEEN years have elapsed since the publication of the fourth edition of this very useful work, and although, in the main, the matter has remained the same, with, of course, certain necessary alterations to bring it up to date, and references to the more newly discovered chemical elements, a new edition is not only opportune, but welcome. The author maintains, and rightly so we think, that there cannot be any great advancement in our knowledge of disease and its propagation, until by means of exact quantitative studies, chemical expression can be given to the life-history of micro-organisms and the cells of the human tissues.

As the title of the book indicates, bacteriological studies are dealt with, only so far as they have any material connection with Nature's hygiene and sanitary chemistry, and, in view of this, we feel sure that the chapters on the eucalyptus, pine, and camphor forests will be read with especial interest.

The author is strongly in favour of the appointment of chemical officer of health to take the place of public analysts. There is, of course, much to be said in favour of his contention, but it is quite possible that most of the Medical Officers of Health are fully equipped for such duties as would devolve upon the officers suggested for appointment.

The Functional Inertia of Living Matter. By D. F. HARRIS, M.D., B.Sc., Lecturer in Physiology in the University of St. Andrews.
London: J. & A. Churchill. 5s. net.

THE character of this volume may be gathered from the subsidiary title, which Dr. Harris has chosen, namely, "A Contribution to the Physiological Theory of Life." He considers that the recognition of *two* physiologically opposite, or complementary properties in protoplasm, is of the greatest assistance to the logical perfection of our conceptions regarding the *modus*

operandi of the activities of living matter. These two properties he terms "affectability," and "functional inertia," and he considers that, by means of them, we are afforded a fuller insight than we have at present into what we might call the "true inwardness" of living matter.

Life Insurance and General Practice. By E. M. BROCKBANK, M.D., F.R.C.P., Honorary Assistant Physician, Royal Infirmary, Manchester. London: Oxford Medical Publications. 7s. 6d. net.

Dr. Brockbank has written a practical and complete account of Life Insurance from the Practitioner's point of view, whether employed as examiner or consulted by a patient as to the prospects of acceptance or not. The book is divided into two parts: Part I. deals with the medical examination of an applicant for insurance, and Part II. with Impaired Lives.

This volume cannot fail to be both interesting and instructive to those whose practice includes insurance work.

A Dictionary of Medical Diagnosis; A Treatise on the Signs and Symptoms observed in Diseased Conditions. For the use of Medical Practitioners and Students. By HENRY LAWRENCE MCKISACK, M.D., M.R.C.P. Lond., Physician to the Royal Victoria Hospital, Belfast. London: Baillière, Tindall & Cox. Pp. xii and 583. 77 illustrations. 10s. 6d. net.

As indicated by its title, this is a list, in alphabetical order, of the diseases and conditions which are commonly met with in general or hospital practice, and the list appears to be distinguished by its completeness. In preparing it, Dr. McKisack has embodied the careful notes, made for his own use and for teaching purposes, during an extended experience, and has consequently given to the profession a volume containing a concise, and, at the same time, an explicit description of the symptoms commonly met with in medical affections. An exceedingly valuable article on "Blood examination" has been contributed by Dr. Houston; also one on "X-ray Diagnosis," by Dr. J. C. Rankin, and one on "Examination of the Sputum," by Dr. MacIlwaine. As a handy book of reference, it will be found so useful that few practitioners will care to be without it, for a few minutes' consultation of its pages, on any particular subject, will serve either to confirm one's own opinion, or to refresh a wearied memory.

The Medical Interpreter. Compiled by PAUL BLASCHKE with the assistance of Dr. GUSTAVE BRESIN; Dr. E. H. SHEPARD, Instructor, College of Medicine, Syracuse University, U.S.A.; ROBERT LEWIN, Tutor of the German Language for Foreign Physicians, and others.

FIRST PART: *A Dictionary of Medical Conversation*, German-English and English-German, giving in both languages a collection of phrases to facilitate conversation between patients and physicians of different nationalities, and showing the exact pronunciation of each word; with a preface from the International Committee of the Red-Cross Societies at Geneva. SECOND PART: *A Dictionary of Medical Terms.* English, French, and German, arranged in single alphabetical order. 3 volumes. Pp. 224, 211, and 450. Dr. WALTHER ROTHSCHILD. London: J. & A. Churchill.

HERR BLASCHKE, some ten years ago, brought out an International Vocabulary (or conversation guide), for military hospitals, in German, French, and German-Russian, which was found to be of the greatest service

by the German Central Committee of the Red-Cross Society during the Russo-Japanese War. The present volumes are a development of the former work, amplified so as to be of use in civil hospitals in different countries.

The conversations are well-arranged, comprehensive, and very well expressed. Provided on each side with the appropriate volume, an English-speaking patient and a German-speaking doctor, or *vice versa*, would be able to give and receive necessary information. There are a few clerical errors which have been overlooked in revision. We had expected a great deal from the dictionary of medical terms, for the ruling idea seemed, in every way, good. A cursory examination proved disappointing, and this feeling was confirmed and intensified by a detailed consideration of the contents. Almost every page has clerical errors, in addition to the long list of errata officially included. These, after all, are but venial mistakes, but the English equivalents as given are in some cases wrong, in others, ludicrous, and in others, crude and barbarous renderings. We offer Herr Blaschke our most sincere condolences, for, to be of any use to practitioners who wish to read the writings of authors in the original English, French, or German, as the case may be, this dictionary, so far as the English part of it is concerned, requires ruthless and thorough revision from beginning to end. Our own copy is now undergoing this treatment, and we hope and expect to see it emerge in a really trustworthy and useful condition.

Anatomical Terminology, with Special Reference to the B.N.A. By LEWELLYS F. BARKER, M.D., Professor of Medicine, Johns Hopkins University, Baltimore; formerly Professor of Anatomy, Rush Medical College, University of Chicago. With vocabularies in Latin and English, and illustrations. London: J. & A. Churchill 5s. net.

DR. BARKER explains that the expression B.N.A. is a shorthand title for a list of some 4,500 anatomical terms, accepted at Basle, in 1895, by the Anatomical Society, as the most suitable designations for the various parts of the human anatomy which are visible to the naked eye. These terms, it is suggested, should be used by all writers and teachers all over the medical world, and the numerous synonyms should be abandoned. When it is remembered that the anatomical terms at present in use, in the various standard text-books, number something like 30,000, it will be readily understood what an immense advantage to both students and teachers the reduction of this number to something less than 5,000 will be. The preparation of this list has been in accordance with certain general principles regarding the formation and use of anatomical terms, and though, perhaps, here and there, some exception might be taken to a few of them, yet, on the whole, we consider that valuable service has been rendered to the profession. The adoption of the B.N.A. generally will, we believe, render intercourse between the members of the medical profession of various countries much readier, and tend to deepen the feeling of brotherhood which is rapidly developing. The lists in the volume are arranged in parallel columns, Latin on the left page, English on the right. References would be much more easily made if the Latin terms, with their English equivalents, had been placed side by side on one page.



Notes by the Way.

The Sources of Tuberculosis.

CONTROVERSY still continues as to the relation between bovine and human tuberculosis ; and it may be useful to summarise the stages through which the argument on this point has passed :—

1. The micro-organism of tuberculosis was isolated by Professor Koch in 1882.

2. The identity of tuberculous disease affecting man and the lower animals was assumed. Probabilities and superficial indications supported the view, though it had not been demonstrated by any rigorous test.

3. At the London Conference of 1901, Professor Koch propounded the opinion that the two diseases were essentially different. He had experimented, he said, on nineteen animals, with pure cultures of tubercle bacilli taken from cases of human tuberculosis, and had found them immune to the infection ; whereas cattle inoculated with tubercle bacilli taken from other cattle quickly developed the disorder.

4. A Royal Commission appointed to investigate the question presented an interim Report in 1904. Its experiments, conducted under the direction of Dr. Eastwood, pointed to the conclusion that Professor Koch was wrong, that "human and bovine tubercle bacilli belong to the same family," and that "in a certain number of cases, the tuberculosis occurring in the human subject, especially in children, is the direct result of the introduction into the human body of bovine tuberculosis."

5. Professor Koch threw doubt upon the value of the English experiments, and re-affirmed his own position at the recent Washington Congress.

6. Professor Sims Woodhead replied to Professor Koch that the conditions of conclusive experimentation on which the Professor insisted were quite obvious precautions and had, as a matter of fact, been observed.

That, broadly speaking, is the history of the dispute, and that is how the matter at present stands.

**Danger and
Precautions.**

THE balance of evidence, as anyone can see for himself if he will study the voluminous Blue Books on the subject, is on the side of the Royal Commission. Professor Koch's objections are presented somewhat in the tone of a special pleader more anxious to win the verdict than to see the truth prevail. His name, however, is more widely known than those of quieter workers, and consequently carries greater weight with the laity, who are not qualified to distinguish between advertisement and fame. The vendors of meat and milk in particular are specially apt to shelter themselves behind his reputation and endorse his views at the top of their voice, not so much because they consider his proofs conclusive, as because they find his doctrines comfortable. That this is the danger was, indeed, evident when the Moderates made friends with the milkmen at the last London County Council elections. Probably the matter will be set at rest, and the last vestige of doubt removed, when the Royal Commission has finished its labours and delivered its full Report. Meanwhile, however, in the face of the strong presumption already established that the invasion of tuberculosis through the alimentary tract is not only possible but common, no precaution in the way of the inspection of meat and milk and dairies ought to be neglected.

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**Insanitary
Dairies.**

A STRIKING illustration of the need for the inspection of dairies is furnished by a Report by Dr. Reginald Farrar, just published by the

Local Government Board, on the sanitary circumstances and administration of the Whitby Rural District. "In the larger majority of instances," says Dr. Farrar, "I found the fold-yards ill-drained and filthy, and the cow-sheds dark, dirty, ill-ventilated, and generally of insufficient capacity for the number of cattle they contained." He adds that "milking is carried out under uncleanly conditions, no attempt, as a rule, being made to cleanse the udders of the cows beyond a hasty rub with a wisp of hay, still less to induce the milkmen to wash their hands." Witnessing the milking of thirteen cows, he noticed that one of them "appeared to be in an advanced condition of tuberculosis." Enquiring what was done with the milk, he was informed that it was given to the pigs. This, the farmer seemed to think, was a sufficient concession to the

principles of hygiene. He had not apparently reflected that pigs are specially liable to tuberculosis, and that he was in this way helping to provide the world with a supply of tuberculous pork.

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The Nursing of
Tuberculosis in
Ireland.

SATISFACTORY accounts are given of the work done by the nurses engaged by the Women's National Health Association of Ireland solely for the nursing and care of patients suffering from pulmonary tuberculosis. In nine months the nurses have had 214 families under their care ; the patients themselves, in over 40 per cent. of the cases attended, requesting the services of a nurse. Of the cases dealt with 37 per cent. showed distinct signs of improvement, and 12 per cent. recovered sufficiently to be able to return to their ordinary work—a very gratifying record. The nurses have also distributed sputum flasks, and reported insanitary houses, working in this way, not only for the patients, but also for the public health. They have further given instruction as to ventilation, etc., and the precautions to be taken against infection ; while the Women's Health Association Samaritan Committee, acting on the information supplied by them, has been able to render valuable material assistance. No less than 87 families, we are informed, were provided with nourishment in the shape of milk, eggs, meat and the like, and 56 families were assisted with such articles as beds, bedding (so that the patients could sleep alone), shoes, and clothing ; while suitable employment has also been obtained for several patients and their relatives. It is an excellent record of work well done and well worthy of support.

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The Diseases of
School Children.

THE Report of the Sub-Committee of the London County Council on the medical treatment of children attending public elementary schools is a gloomy and disconcerting document. Of most of the chronic ailments, both major and minor, to which children are specially liable, we read that they are "widely prevalent." Ninety per cent. of the children examined were found in urgent need of a visit to the dentist. Large numbers of them were kept away from school by ringworm. There was an unduly large proportion of cases of adenoids, defec-

tive vision, suppurating ears, tuberculosis, and general debility. Whether the facts demonstrate that physical deterioration of the race, of which the pessimists are so fond of speaking, is a moot point ; but it is, at all events, well that we should know the worst before we proceed to apply the remedies. In the case of the majority of the ailments, the sub-committee states, the resources of the hospitals are quite inadequate to cope with the difficulty. It is, therefore, recommended that the Council should establish school clinics at suitable centres in the Metropolis, to which children may be sent or taken for treatment. That, we expect, will be the solution adopted. It involves, of course, the expenditure of public money ; but, as the national physique is the chief of the national assets, such outlay may properly be classed as remunerative.

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The Destruction of Vermin.

WE have already given expression to our sympathy with the aims of the Incorporated Society for the Destruction of Vermin. The first number of the Society's "Journal" now lies on our table, giving an outline and some particulars of the plan of campaign. The difficulty of drawing a sharp line of demarcation between the insects and reptiles which are noxious and those which are not is recognised and illustrated by an anecdote. Some one, it appears, once conceived the happy thought of introducing the mongoose into Jamaica for the destruction of rats and mice. The mongoose not only destroyed these rodents, but proceeded to destroy small birds. The birds, however, were playing a useful part in the economy of things by eating ticks of the harvest bug fraternity. When the birds disappeared, the ticks increased and multiplied, with the result that a stroll on Jamaican grass, at certain seasons of the year, now invariably entails a painful sequel in the shape of cutaneous irritation. The inference to be drawn is that things are not always what they seem, and that man can only disturb the balance of nature at his risk and peril. There are certain kinds of vermin, however—rats, flies, fleas, and mosquitoes, for example—of which it may safely be said that they are our enemies without qualification, rendering us no services to compensate for their activity in the dissemination of disease. If the Society helps us to keep these under, the result will be clear gain.

Practical Notes.

BARTHOLIN'S GLANDS.—On each side of the vaginal outlet, at the posterior third of each labium majus, is situated a small glandular body, known as the vulva-vaginal gland, or the gland of Bartholin, or of Duverney. The glands of Bartholin are the homologues of Cowper's glands in the male. They are round or oval bodies of a reddish yellow colour, and measure about half an inch in their longest diameters, being of the size of small hazel nuts. They are situated somewhat deeply between the superficial perinæal fascia in front, and the transversalis perinæi muscles behind, and present the histological structure of tubulous glands. The ducts of these glands are long and delicate, and pass forwards and inwards to terminate in orifices, which are situated immediately in front of, and just outside, the base of the hymen on the inner side of the labia majora at the posterior end of the labia minora. Where the labia minora pass further backwards, the orifices of Bartholin's glands are situated on the inner aspect of these structures. They are lined by a high cylindrical epithelium, with basally situated oval nuclei. The normal secretion of these glands is a serous fluid of somewhat milky appearance, and is scanty in amount.

Bartholin's glands and their ducts may participate in many morbid conditions; they may become inflamed, cystic, or the seat of new growths. Inflammation may result from injuries, such as kicks, falling astride objects, and violent or excessive sexual intercourse, from septic discharges from the uterus, vagina, or urinary tract, from an extension of inflammation from an inflammatory lesion in adjacent structures, or from the occurrence of suppuration in a cyst of the gland or duct, which is nearly always gonorrhœal in origin, and it is to their frequent implication in this infection, and the character of the lesions produced by it, that Bartholin's gland and its duct owe their importance in gynæcology.

In a gonorrhœal infection, a specific vulvitis results, and usually extends along the ducts to the glands, and an abscess eventually results, the orifice of the glands becoming occluded

as the result of the inflammation. Unless the pus is evacuated by incision and scraping, fistulous openings allow of the escape of the pus, which is of a foul odour, and often profuse in amount. Gonococci may usually be demonstrated in the discharge.

The sinuses usually remain after the acute inflammatory condition has subsided, and the gland remains hypertrophied and indurated, and can readily be felt as a hard mass between the finger and thumb. A slight greenish purulent fluid continues to escape from the duct or sinuses, which, containing gonococci, remains infective, and may infect the male during sexual intercourse, or by auto-infection may set up an acute gonorrhœal vulvitis, or during the puerperium may be the cause of puerperal sepsis. The discharge, if scanty, may be obtained by "milking" the duct, *i.e.*, by pressing on the duct from before backwards through the lateral vaginal wall. During the acute stage of the disease, there is seen round the orifice of the duct a bright red area, characteristic of gonorrhœal infection, and known as the *gonorrhœal macula*, an appearance which often long remains after all the acute inflammatory symptoms have subsided, and, by some authorities, is considered to be almost certain evidence of pre-existing gonorrhœal infection.

RECOGNITION OF TUBERCLE BACILLI IN SPUTUM.—The importance of this subject is such as to amply justify the numerous methods that have been proposed; perhaps more lives have been saved by the demonstration of the bacilli in the sputum than by any other single diagnostic process. Its special value is that it allows of a definite diagnosis of the disease, from which there can be no appeal, and which leads to the enforcement of the necessary methods which the patient might refuse to adopt if the nature of his complaint were only a matter of surmise. The latest method for the homogenisation of the sputum is that suggested by Nakas Abe, of Kyoto (*Arch. f. Hyg.*, lxvii., p. 372), who shakes 5–10 c.c. of the material with 15–30 c.c. of a solution containing 2 grams of sublimate and 10 grams of salt in a litre of water. Of the mixture thus obtained, 15 c.c. are centrifugalised for 10 minutes, and the deposit treated in the ordinary way. If the

bacilli are very scanty, the material may be filtered through a Berkfeld filter, when the solid material which collects on the walls will contain the organisms.

DIFFERENTIATION OF TUBERCLE AND LEPROSY BACILLI.—This is occasionally of importance in diagnosis, and it is quite possible that mistakes have occasionally arisen. The best test is the inoculation of animals, which are never affected with leprosy: the only fallacy which might arise would be occasioned by the concomitant presence of the two bacilli, in which case the animal would become tuberculous, and the result would be misleading as regards the leprosy bacillus.

Another method is based on the fact that the latter bacilli, as a rule, are even more acid-fast than those of tubercle. A slide is spread with some of the material to be examined, and also (in a separate spot) with some tuberculous sputum, pus, etc. It is then stained in the ordinary way, and the decolorisation carried on until the tubercle bacilli are decolorised, when leprosy bacilli will be found in most cases to retain the red colour of the carbol-fuchsin. The latest method is that of Jauramoto (*Cnt. für Bakt.*, I. Orig. xlvii.), who fixes the films in the flame and soaks them in a 5 per cent. solution of nitrate of silver for 10 minutes at a temperature of 55°–60° C. The slide is then treated in a reducing or developing bath of pyrogallie acid 2 per cent., tannic acid 1 per cent., aq. dest. ad 100. The tubercle bacilli are coloured black, whereas leprosy bacilli are unaltered, and can be stained with carbol-fuchsin in the ordinary way. If this method should stand the test of experience, it will be of considerable value, allowing the two organisms to be differentiated when present in the same material.

THE CUTI-REACTION IN TUBERCULOUS CHILDREN.—Von Pirquet has recently published the second series of 100 cases of children, who have come to autopsy after having been tested for tuberculosis by his method, and the results are of some interest. He now uses undiluted old tuberculin, and abrades the skin in three places, applying the fluid to two, and leaving the third as a control.

In the whole 200 cases, tuberculosis was found *post-mortem*

in 89. Of these, 60 gave a positive reaction on the first application, and 29 were negative. Of the latter, some reacted positively on a second application of the test, and others were suffering from measles, a disease which, as von Pirquet had already shown, renders the test quite useless; the period, during which no reaction takes place in a tuberculous child attacked with measles, begins at the time of the appearance of the rash, and lasts about a week. The other cases in which tubercle was found after death, and in which no reaction was given, were almost all suffering from generalised (miliary) tuberculosis, in which, as in cachexia from other forms of tubercle, the reaction fails to appear, owing probably to a deficiency in the patient's power of resistance. In young children this phenomenon is not marked, and a good reaction may be obtained throughout the disease, but in older children it begins to lessen some weeks before death. Thus in cases in which generalised tubercle or tuberculous meningitis is suspected, a positive reaction may be taken as definite proof of the truth of the diagnosis, whereas a negative one does not preclude it. A positive reaction followed after an interval by a negative one is almost certain proof of the disease in a generalised form.

Von Pirquet makes the interesting suggestion that the frequency of progressive tubercle after measles is owing to the fact that the bacilli have an opportunity to develop during the period of non-reaction, when we may fairly assume the patient's power of resistance to be low.

The 109 cases, in which no tubercle was found *post-mortem*, all failed to give a reaction. There were two doubtful cases, each of which gave a positive reaction.

Von Pirquet concludes that every reaction is caused by infection with tubercle, and that, in general, a newly acquired reaction gives a severer reaction than an old one.

The method is less applicable in adults, owing to the frequency with which they are the subject of healed tubercle. Most people react on the second application of the test ("secondary reaction"), but in some cases there is a slight positive result after the first. Only a very severe reaction at the first test is of any importance; but repeated applications, attended with negative results, prove that the patient is not

tuberculous, unless of course the disease is generalised or the patient cachectic.

Von Pirquet claims that the cuti-reaction with undiluted tuberculin is more sensitive than the ophthalmo-reaction with a 1-per-cent. solution, and rightly discountenances the latter method on account of the very disagreeable results which it may cause.

HÆMOPTYSIS IN PULMONARY TUBERCULOSIS.—The treatment of this condition (so frequent and so alarming to the patient) is ably summarised by Elliott (*Canada Lancet*, December, 1908). The main essential is complete and absolute rest in the semi-recumbent posture. As Celsus said, "Rest, serenity, and silence are necessary, and the head of the patient lying down ought to be high." The patient must not be allowed to undress himself: an hour or two after the brisk bleeding has ceased this may be done by the nurse, who may wipe away the blood from the mouth or hold a vessel to receive it. He must not feed himself, and if an arm or a leg gets cramped it may be moved by the nurse. All causes of mental excitement, such as the presence of visitors, are to be avoided, and the patient's fright and anxiety, which are usually considerable, are to be allayed; a cold cloth to the forehead may also be grateful.

The only drug of undoubted value is morphia, which should be used to allay the excitement and also to *check* the cough if severe; it should not be entirely abolished, or the bronchi may remain full of clot, and broncho-pneumonia supervene later. The use of drugs which lower blood pressure is unsatisfactory. Aconitine, however, is of some value, and may be given when the pulse is rapid; $\frac{1}{200}$ gr. every 15 minutes will usually render it sufficiently slow in a few doses. Of the substances which increase the coagulability of the blood, calcium lactate is the most useful. Fifteen grains may be given every four hours the first day, then thrice daily for three days, after which it should be discontinued for a time. Elliott also recommends rectal injections of a solution of gelatine in water, 6 ozs. of a 1-in-20 solution being given thrice daily. The food should, of course, be fluid and non-irritating, and the total amount of liquids should not exceed 50 or even 25 ozs. in the 24 hours.

Preparations and Inventions.

VERONAL-SODIUM.

(London : The Bayer Company, Limited, 19, St. Dunstan's Hill, E.C.)

Veronal-sodium is a white crystalline powder which is readily soluble in 1 in 5 parts of cold water, and, therefore, has a slight advantage over veronal itself. The chief indications for its use are precisely the same as for veronal, viz., sleeplessness unaccompanied by pain. Veronal-sodium is soluble in .9 per cent. solution of sodium chloride, and it may, therefore, be administered per rectum from which it is absorbed. The dose is 5 to 15 grains given half an hour before bedtime, but the smaller dose should always be tried first. It is put up in compressed tablets of 5 grains each, and these are supplied in bottles containing 25 or 100 tablets.

MEDINAL.

(London : Messrs. A. and M. Zimmermann, 3, Lloyd's Avenue, E.C.)

Medinal is the mono-sodium salt of diethyl-barbituric acid. It is a new soluble hypnotic which has been introduced by Messrs. Schering of Berlin, with, we understand, very considerable success. The drug is supplied in tablets each containing $7\frac{1}{2}$ grains, and it can also be obtained in powder form. The dose is half to one tablet dissolved in water or a little sweet wine ; it should be administered half an hour before bedtime, some three to four hours after the last meal.

GLAXO.

(London : The Glaxo Company, Gracechurch Street.)

Glaxo is a product which contains the solids of milk in a sterile, soluble form. It contains no starch. The milk which is used in the preparation of Glaxo is obtained in New Zealand where the factory is, and where the Government control of dairy industries and of the inspection of cows is rigid. Every care is taken throughout the preparation of Glaxo that it should be obtained in a sterile condition. The tins in

which it is supplied are very carefully handled and sealed. Chemical analysis of Glaxo shows it to consist of the following ingredients :—

Proteins	-	-	-	22·2	per cent.
Fats	-	-	-	27·4	„ „
Lactose	-	-	-	41·0	„ „
Salts	-	-	-	5·9	„ „
Water	-	-	-	3·5	„ „

Provided that Glaxo is prepared as is directed, it forms an excellent and safe food for infants, especially during the summer months when diarrhoea is so prevalent.

VI-TONICA.

(Manchester : Messrs. Slack & Cox, Limited, Hyde Road, Manchester.)

Vi-Tonica is a pleasant and refreshing beverage possessing stomachic and therefore general tonic properties. It is non-alcoholic, and may in consequence be taken as a “temperance beverage.”

TAYLOR'S BED REST.

(London : Messrs. Braun & Co., King's Cross, W.C.)

Taylor's bed rest consists of a light wooden frame which may be hinged to the top of the bedstead. The back rest is composed of spring mattress wire. The whole is light, portable, inexpensive, and, above all, eminently practical. When in position it may be readily drawn down to the patient, instead of the patient having to be raised up to it. When supported by this Rest, the patient can quite easily take food, read, and write, since the patient's arms are in no way impeded. When its use is no longer required, the Rest may be readily replaced at the back of the bed. It is therefore always to hand and never in the way.



THE PRACTITIONER.

MARCH, 1909.

SOME POINTS IN THE DIAGNOSIS AND TREATMENT OF "DERANGEMENTS" IN THE KNEE JOINT.

By ARTHUR E. BARKER, F.R.C.S.,

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It is hard to say whether "derangement" of the knee joint, due to displacement of the semilunar cartilage, is of more frequent occurrence nowadays or no, but it is quite clear that all surgeons in active work are more often consulted about it now than formerly. It appears to occur in all walks in life, in both sexes equally, so far as my own experience goes, and at all ages, except at the two extremes of life—in other words, at the time of greatest physical activity. Looking over a long series of my own cases, in hospital and private practice, I note the army and navy as largely represented, also the artisan classes; but particularly is it found among those who indulge in active games, such as cricket, football, tennis, and golf.

The amount of disablement induced by the accident varies with the character and degree of the lesion. For there can be no doubt, from what one sees, that there are remarkable differences in the way in which the semilunar cartilages may be and are affected. In one case, a meniscus may be only sufficiently loosened, by strain, from its capsular attachments, to admit of its occasionally being lightly and transiently caught between the surfaces of the femur and tibia, while, in other cases, it is completely and permanently detached in its whole periphery, and is only held at both its cornua, or only at one, anterior or posterior. Between these extremes there is met with every degree of detachment. It is not to be wondered at, therefore, that the degree of disablement should vary, from a slight occasional pinching pain without any "locking," to the most excruciating suffering, with fixation of the joint in more or less flexion for a longer or shorter period. Again, even with complete separation of the meniscus at its periphery, there may be only a very

rare locking, accompanied by moderate pain. This appears to be the case where the cartilage has slipped completely into the middle of the joint between the condyles, and has become more or less shrunken round the crucial ligaments. The difficulty of making a close estimate of the degree of injury sustained by a semilunar cartilage is, in any case, enhanced by the fact that there are several other conditions in knee joints which produce symptoms closely resembling those due to displacement of the meniscus. In the first place, there may be true loose bodies, cartilaginous, bony, or fibrous, detached and floating about into any part of the cavity. Next, there may be more or less pendulous fringes or tags of hypertrophied synovial membrane, long enough to become engaged between the bones. Thirdly, there may be rheumatic nodules or lips on the borders of the bones, which interfere with the smooth working of the ligaments and capsule, giving rise to milder pinchings, or lockings, as the capsular structures play over them.

It is not always easy to distinguish between these three conditions, but the importance of doing so is obvious. It is clear that, in the chronic rheumatic condition, but little can be done by operation, unless some nodule becomes very obviously prominent, and, like some of the congenital exostoses, is clearly interfering with the mechanism of the joint.

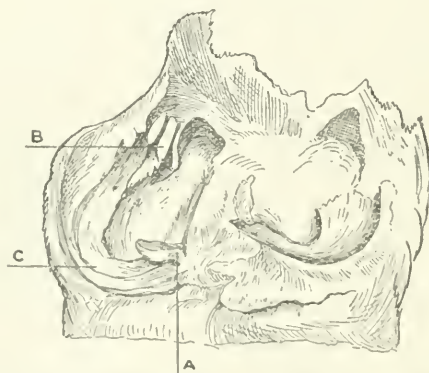


Fig. 1.—Knee joint showing tags A and B projecting into joint.
C. Internal semilunar cartilage.

(Museum University College Hospital Medical School.)

In the case of loose bodies, although the joint will have eventually to be opened for their extraction, it is clearly of

importance to diagnose their presence and position beforehand. But the greatest difficulty met with in these cases, is to distinguish between the symptoms of detached semilunar cartilage and the *attached* fringe or fibrous tag of synovial membrane found occasionally in joints which have been wrenched, or otherwise injured, and have, as a consequence, been the seat of a subacute or chronic synovitis with hyperplasia of the lining membrane (Fig. 1). In some cases, though one may suspect such a condition, its existence can only be proved by opening the joint. And even if this is done, unless we are unaware of the possible existence of such tags and their most probable position, we shall, of course, not look for them, and, finding the meniscus normal, close the wound without relieving the patient, to his and our disappointment.

It may be premised that the two most prominent symptoms, common to all these derangements of the mechanism of the knee, are pain, a sense of insecurity, and, more or less, a sudden catch in the movements of the joint, resulting in actual "locking," in the most pronounced cases, in one or other degree of flexion.

In regard to pain, we need to be reminded that the articular cartilage is itself insensitive. It is designed to bear the weight of the body and all kinds of jars without suffering. The same may be said of the semilunar cartilages themselves. But these are attached to the capsule, synovial membrane, and lateral ligaments, and, through them, to the periosteum, all of which are supplied with sentient nerves, and it is through the strain on these structures that pain is produced when a meniscus is torn. When a semilunar cartilage is completely detached at its periphery, and the loop thus formed slips into the intercondyloid notch, no pain is complained of, unless it becomes caught between the bones, or between the posterior ligament and condyle. The sharp pain then felt is due to the stretching of the ligaments. One has only to consider for a moment the enormous leverage operating in order to realise this. If we take the head of the tibia as the fixed point, and the shaft of the femur as the length of the lever, and contrast this with the distance of the internal lateral ligament to the point of resistance, where the semilunar cartilage is jammed between the bones, the force dragging apart the two terminal insertions of the lateral or posterior ligaments can be easily gauged.

As a matter of fact, the pain in all these cases is almost invariably referred to the inner aspect of the joint at about the lower attachment of the internal lateral ligament. In some few cases, I have found it referred to the posterior and inner aspect, just behind the internal condyle. I have always thought that this was due to the stretching of the ligamentum posticum during the act of extension or extreme flexion, while the displaced cartilage was keeping the bones apart. Again, it will be found, in rare cases, that pain is felt behind the joint when the limb is flexed by passive movement. These are often cases in which the patient cannot quite extend the limb after the accident. This can be explained, if we imagine the detached cartilage to lie behind the inner condyle, between it and the posterior ligament, and pressed backwards against the latter by flexion or extension.

The mechanism of the displacement, in all forms, is almost invariably the same, and can be inferred from the usual history given, and from what is seen when the joint is opened. In nearly every case, in which my patients have been only using moderate exertion when the lesion took place, they have given the same account. The limb has been slightly flexed, and the foot and tibia inverted. Now, if a knee-joint is opened by operation in the way to be presently described, it will be seen that, in this position of moderate flexion and reversion of the leg, the internal meniscus recedes towards the centre of the joint. Where complete peripheral separation has taken place, and the semilunar cartilage lies in the intercondyloid space, if it is drawn into its normal position with a hook during extreme flexion, and the joint is then at once extended, it will remain in its normal position so long as extension or only slight flexion continues. Let the operator now slowly flex the knee, and he will see the meniscus recede from the peripheral structures. If he now rotates the tibia outwards, the semilunar cartilage will pass further and further between the two bones until, at one moment, it will suddenly slip under the convex surface of the inner condyle and into the space between the condyles. It appears, therefore, that in the normal movements of the articulation, the elasticity of the meniscus is constantly drawing it inwards towards its corneal attachments, and it is only held in its normal position in health by its peripheral connection with the capsule. Indeed, if we

look at the normal unopened knee-joint in thin people, we can draw the same inference. During complete extension, we can see and feel, immediately above the cartilaginous edge of the articular surface of the tibia, a fulness from the edge of the patellar ligament to the internal lateral ligament. But, in flexion, this disappears, and is replaced by a furrow which is increased by eversion of the tibia. If, in this position, the meniscus gets caught between the bones, owing to any fault in its lubrication, or roughness from rheumatism, or past sub-acute synovitis, it cannot return to its normal position during extension, but the capsular structures must do so, and the result is that they are more or less torn away from the periphery of the fixed semilunar cartilage. If but slightly torn, the accident may be recovered from, and reunion may perhaps take place. But more usually, owing to its attachments being now slacker than before, it recedes, each time the knee is flexed, further inwards, until some day it gets more firmly caught, when during extension the rent is made greater. Ultimately, it is com-

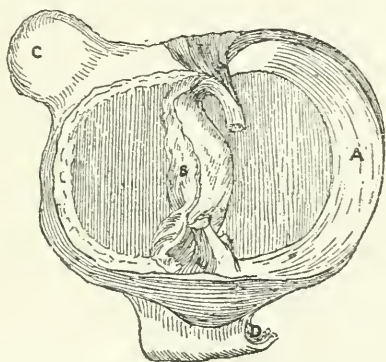


Fig. 2.—Upper surface of the tibia, after Quain. The internal semilunar cartilage (A) in situ; the external (B) (drawn from the specimen after removal by operation) in the position it occupied before removal in Mr. D.'s case.

A. Int. S. Cart. B. Ext. S. Cart. C. Fibula. D. Lig. patella.
EE. Crucial ligaments. (Private specimen.)

pletely detached by successive tears (Fig. 2), and it has no longer any capsular connection, but is simply a loop of fibrous tissue held by its two cornua, and liable to get engaged in one or other position between the tibia and femur, or between the latter and the firm posterior ligaments, and cause "locking." All this can be seen by anyone who has operated on large

numbers of these cases in various stages of the lesion.

The symptoms depend upon the degree to which separation of the cartilage at the periphery has gone. If very slight, the "pinching" pain felt at the time of its occurrence may soon pass off, and only slight tenderness may remain, and perhaps a little subacute synovitis, for a few days. But when separation is greater, and the meniscus is firmly caught as above, the wrench to the ligaments produces the most intense anguish, sometimes causing faintness, and more or less locking takes place in the semi-flexed position. Where the cartilage is once altogether free at its outer margin, and has slipped into the intercondyloid space, there may be at times no pain at all for long periods. But, as a rule, sooner or later it becomes wedged between the bones in some unusual movement of the joint, accompanied by flexion and rotation of the tibia outwards, or under one of the ligaments behind, and pain and locking are the consequence. The pain in the latter case may be increased by flexion, just as the pain of extension is felt when the meniscus gets caught between the bones. This has been well illustrated in a private case lately.

To distinguish these symptoms from those due to chronic rheumatoid changes in the joint is not easy. But the history of the patient as to rheumatism, and the condition of other joints, as well as his age, will help us. Irregularities at the articular margins of tibia and femur may be felt, and the smoothness of movement be gone. Moreover, the pinching or locking may take place in irregular positions, and not in those characteristic of the jammed meniscus. Again, the patient will probably never have free intervals of perfect use of the limb, but will suffer, more or less continuously, from this and from pains, especially in cold weather.

The symptoms, due to a tag or fringe in the loose synovial and fatty tissue behind the ligamentum patellæ, are less distinct than those due to a loose or detached meniscus, but sufficiently so to suggest the latter. There is the same pinching or catching pain at times, but no decided locking. But the patient has a sense of insecurity in the joint, almost continuously, while, with a loose meniscus, this is only occasional. I have never, in either case, been able to convince myself that there was anything to be felt with the fingers at the border of the joint under the capsule. But little movable prominences have

been described. Beyond these points of difference in the degree of disablement, I cannot describe any differences between the symptoms of the two conditions.

It appears as though an absolutely accurate diagnosis of what has taken place in the knee in one of these derangements will defy all analysis, until a very careful and long series of observations of the state of things before operations is checked by close scrutiny of what is found when the joint is opened. We know now much more about the mechanism of these derangements than a few years ago, but we have still much to learn. The subject is well worth study, for all these conditions are very disabling.

The question whether or no these derangements of the knee joint ought to be operated on is of course greatly influenced by our power of diagnosing them. It seems quite clear that, if chronic rheumatic irregularities of the bones are the cause of them, but little is to be expected from operation. All the other varieties can be, and are, relieved by the removal, on the one hand, of true loose bodies or of the detached or loose meniscus, and, on the other, of the projecting fringe or tag, each of which becomes at times more or less caught between the femur and tibia and ligaments. But several questions have to be settled before we undertake such operations. The first is the amount of disability induced by the derangement. This is not invariably extreme, certainly at first. But, in the majority of cases, if not in all, so far as one can learn, the condition ultimately becomes a serious disablement. The subjects of the condition are prevented from following an active life, and, in many cases that I have had under my care, have been subjected to serious risks from falls in swimming, in cycling, or riding on horseback. These risks appear to increase as time goes on and weight increases. I have known some very serious falls to have been caused by the condition in middle life.

The next question is whether there exists any risk in the operation. The answer is that there does, unless the surgeon fully realises what antisepsis means in connection with opening and manipulating the structures of the knee joint. My own personal experience shows no ill effect in any case. One cannot be consulted in a number of these cases without being made aware that a widespread conviction prevails, that many of the operations for the relief of derangements of the knee

joint are followed by serious stiffness of the part. This must mean either that the condition has been wrongly diagnosed by the operator, or that there has been a failure in his aseptic precautions. It may be said that an operation of the kind referred to, carried out with delicacy and a due regard to the structures, which should not be interfered with (*e.g.*, the internal lateral ligament), involves little, if any, risk to the articulation immediate or remote, if the patient's general condition is good.

Again, a doubt still exists in the mind of some who suffer from loose semilunar cartilages, as to whether an operation will give them complete relief, and enable them again to enjoy active exercise. This doubt is soon allayed by an appeal to those who have been properly operated on. The testimony of those who have had the cartilage neatly removed, whether they belonged to the Army or Navy, or were cricketers, footballers, golfers, or equestrians, has been in my experience, always the same. They have had complete relief if the joint has had due rest for a time after the operation. In cases in which, in the earlier days of these operations, there was some hesitation about removing the meniscus, and it was only stitched back into position, there have been instances in which a second dislocation has more or less taken place years after, as perhaps might have been expected. But where a displaced semilunar has been completely and skilfully removed, I do not know of any subsequent disability being reported.

There appears, then, to be every ground for assuming that, in proper cases, and with complete asepsis, in skilled hands operation is not only justifiable but called for.

For any operation of the kind on the knee joint, a careful and rigorous preparation of the skin of the part should be begun at least a couple of days before it is undertaken. Too much care as to shaving and hot washings cannot be observed. It is easy to provide sterile instruments, sutures, and dressings by boiling and steaming; and nothing else need come near the field of operation.

The skin incision, which I have always used, is a curved one, commencing over the ligamentum patellæ, and sweeping slightly downwards and outwards to end over the internal lateral ligament. Its lowest point lies about half an inch

below the articular border of the head of the tibia. A second stroke of the knife should deepen this cut to the bone, dividing the expansion of the capsule and the periosteum. With an elevator, the latter is stripped upwards from the bone until the edge of the articular cartilage is bare, and the joint is opened *under* the usual situation of the semilunar cartilage. If the latter is still attached to the capsule anteriorly, it now rises with it as the knee is flexed, as it should be strongly at this point. If it is not detached more than a little anteriorly, it will remain applied to the convex surface of the femur normally, and its front border will be seen roughened by the rent, and often stained by the old bleeding. But though it may be still attached anteriorly, it may often be demonstrated, by strong flexion and rotation of the tibia outwards, to be torn peripherally or posteriorly, and a steel director may be passed between its free torn margin and the capsule. This free margin, in long standing cases, will be seen to be polished and rounded, in recent cases to be ragged. But, owing to the difficulty of diagnosis mentioned above, the “derangement” of the joint may be found to be due to other causes than a lesion of the meniscus. It may be seen to be caused by the presence of a hypertrophied fringe of synovial membrane, or a tag of fibrous tissue (Fig. 1) projecting either from the edge of the meniscus, or the synovial tissues usually behind the ligamentum patellæ. In order to see these well, the joint will have to be flexed to the fullest extent, and the tibia everted as much as possible. By these movements, it is surprising what an extensive view can be obtained of the inner half of the articulation, and a projecting body can hardly be missed if present. It can then be caught with a fine hook drawn forward and cut off with scissors.

But if the meniscus is partially separated anteriorly from the capsule, the question arises whether it should be stitched to its former bed, or completely removed. Formerly, many surgeons hoped that a permanent cure could be secured by this fixation. But experience has shown that, as the forces which produced the first rent were still in existence after the operation, a recurrence could take place even years after, and this has led to the view that it is better to remove the whole semilunar cartilage when it is found even only partially separated at its periphery. To do this is comparatively simple.

It is only necessary to fix a hook in it, and draw it firmly inward towards the centre of the articulation. It will then be seen to peel itself off the capsule in the direction of its fibres, and to remain only attached by its cornua. These can then be divided by scissors.

But it is possible that, on opening the joint as above underneath the meniscus, no rent or other defect may be at first seen in it, and it may appear to lie perfectly in position. This, to the beginner, may be very disconcerting. He may believe he has opened the joint in vain. But if he pulls on different parts of



Fig. 3.—*Internal semilunar cartilage torn at its posterior attachment eight years before operation. The posterior torn end is now seen to be rounded off. (Private specimen.)*



Fig. 4.—*Internal semilunar cartilage torn at its posterior attachment eight years before operation. Posterior end folded outwards from its attachment and marked by moulding to the internal condyle of the femur. (Private specimen.)*

the meniscus with a hook, he will often find that it is really detached, perhaps far back (Figs. 3 and 4). In such a case the separation must be completed until it hangs on only by its cornua, and these are divided. This has happened to me on more than one occasion, but close examination has prevented my closing the wound without finding anything. If the internal meniscus should appear to be everywhere normal, it may be that it is the opposite one which is dislocated. This can, in such a case, be seen lying against the crucial ligaments, and can be hooked forward and removed as described. This was my experience with an elderly gentleman with all the symptoms, for many years, of

dislocation of the *internal* semilunar. The joint was opened as explained above, but this cartilage was normal in every way. Further inspection in strong flexion and eversion of the tibia showed the *external* cartilage curled up round the crucials (Fig. 2). It was hooked forward, and, being only attached by its cornua, was easily removed through the original internal incision. This is the only instance of dislocation of the external semilunar cartilage I have met with during life.

This experience reminds us that the joint may be opened possibly on a wrong diagnosis, and might have to be closed without finding anything requiring removal. If this should be the case, the method given above, of opening it without disturbing the relations of the meniscus at any part of its periphery to the capsule, and without any injury to the internal lateral ligament, ensures, at all events, that the joint is not weakened by our operation. We have simply to draw down the periosteum and capsule, to which it has remained in its former relations, and stitch these into their old position, and no harm is done. The parts are as strong as before, which would not be the case were the incision made above the semilunar cartilage or the lateral ligament divided. However, this is less and less likely to occur as time goes on, and we learn more and more of the points upon which a sure diagnosis can be based. I can only recall one case in which, on opening a joint on the suspicion of a semilunar derangement, nothing to account for the symptoms was found.

In order to finish the operation, nothing now remains but to stitch the skin into place without drainage, and to cover it with a voluminous sterile gauze dressing, firmly and evenly bandaged. Over this it is well to apply an ice bag for a few days. This, I think, prevents effusion, and is grateful to the patient. After a full week of rest, the stitches can be removed and collodion and gauze applied to the wound. In two weeks the limb may be moved, and in three, gentle walking should be encouraged. Of course, the patient need not remain in bed more than for about ten days. He should, however, spare the joint from all overstrain for a couple of months, and only gradually return to ordinary active exercise. In other words, it is well to allow time for all scar tissue to become firmly organised and contract.

DR. MARSHALL HALL AND THE DECAY
OF BLOODLETTING.¹

BY D'ARCY POWER, F.R.C.S.,

Surgeon to, and Lecturer on Surgery at, St. Bartholomew's Hospital.

ON looking up the names of my predecessors in this chair for the purpose of seeing what they had done, and how they had promoted the objects with which the Harveian Society of London was established in the year 1831, I got no further in the list than the names of your first two Presidents, Dr. Anthony Todd Thomson and Dr. Marshall Hall. In the early years of the Society these officers were elected in pairs. The more illustrious of the two was Dr. Marshall Hall. Anyone who was asked about him would reply at once that he introduced a method of resuscitating the apparently drowned, a method which was replaced by that of Dr. Sylvester, which in turn has given way to Professor Schäfer's more scientific plan of treatment. To physiologists the name of Marshall Hall connotes the reflex action of the spinal cord; the medical politician remembers him as the outspoken champion of the one-portal system of admission to the medical profession, which has not yet been, and perhaps never will be, adopted in this kingdom. The student of sanitary science recalls Marshall Hall as a staunch advocate of a main drainage system for London, when the Metropolis was still dependent upon cesspools for the destruction of its sewage. The historian of medicine and the general practitioner know him as one who weaned the profession from the pernicious habit of blood-letting, not because he disbelieved in its efficacy, but because he endeavoured to lay down rules for its rational employment. It is in this aspect of his work that I wish to consider him for a short time this evening, because I like to think that this stupendous revolution in practice, which has no doubt saved hundreds of thousands of lives in this country alone, was inaugurated by the first President of the Society at the very time when he was one of our members, and the first

¹ The substance of a Presidential address delivered at the Harveian Society of London.

intimation of it, perhaps, formed the subject of one of his earliest communications to our predecessors here.

Marshall Hall was born near Nottingham, in 1790, the son of a Wesleyan cotton manufacturer, and to this inheritance he doubtless owed the very strong religious views which he held throughout his life. Indeed the first story recorded of him points at once to the religious and experimental aspects of his character. He asked one of his father's workmen, after he had attended the discourse of an ardent minister, whether hell extended beneath the sea as well as underground, and, on being told that it did, he said, "Then, why not bore holes and put out the fire?" His father was long remembered as the first manufacturer of cotton who used chlorine to bleach his goods instead of following the established practice of exposing them to the air for long periods of time.

After a short apprenticeship to his friend Robert Cook, at Newark, Marshall Hall entered as a medical student at the University of Edinburgh, where he matriculated, in 1809, and graduated M.D. in 1812, after filling the distinguished office of President of the Royal Medical Society. He was appointed resident physician's clerk—or, as we should now call it house physician—at the Edinburgh Infirmary, and, at the expiration of his term of office, he spent some months of the year 1814–15 in Germany and France, where he gained that remarkable facility in speaking and writing French which stood him in such good stead in later life. On his return to England, he practised for six months at Bridgewater, and then moved to Nottingham, where he soon gained a large practice, and became known by his book *On Diagnosis*, the fruit of his experience at the Edinburgh Infirmary. In 1825, he was elected physician to the Nottingham General Hospital, and, in the same year, he contributed an essay on bloodletting to the Royal Medical and Chirurgical Society. He moved to London, in 1826, living first in Keppel Street, Russell Square, and afterwards in Manchester Square. At this time he was doing excellent original work on the minute structure of the capillaries, on the hibernation of animals, and upon the physiology of respiration. He discovered the reflex action of the spinal cord in the course of his experiments upon respiration, for, accidentally touching the skin of a headless

newt with a needle, he observed that movements took place. He announced the fact at a meeting of the Zoological Society, on 27th November 1832, and described the reflex action of the cord and medulla more fully at the Royal Society on 20th June 1833.

This addition to physiological knowledge met a fate which is not unusual with important discoveries. It was first denied, and the discoverer was reviled; it was afterwards tacitly accepted, and, in the end, it was openly adopted, and declared to be nothing new. Marshall Hall fought valiantly against calumny and misrepresentation. His views were accepted at once by the great French and German physiologists, Flourens and Müller, and he lived long enough to see reflex action accepted as a fundamental fact in the physiology of the nervous system. But the struggle was so severe and so personal, that, in its course, Marshall Hall was driven to make the memorable statement: "I appeal from the first half of the nineteenth century to the second."

In London, he obtained a considerable practice, a part of which was afterwards taken by (Sir) Russell Reynolds; but Marshall Hall was never attached to any hospital, and it was not until 1841 that he was elected a Fellow of the Royal College of Physicians of London. The strain of a large practice proved too much for his strength, and he retired in 1853, to spend his life in extensive tours in the United States, in Italy, and in France. The question of slavery in America interested him greatly, and he naturally ranged himself with the Abolitionists. He died at Brighton, on 11th May 1857, from cancer of the upper part of the œsophagus, and it was during the enforced idleness of his lingering illness that he invented, for the Royal Humane Society, the method of restoring the apparently drowned to which his name is attached. The year before his death, he proved himself a pioneer in toxicology, by suggesting that a living frog might be employed as a very delicate test for strychnia. The principle thus enunciated has been extended, and physiological reaction has proved itself a useful test for some cases of poisoning by alkaloids.

It is with the work of Marshall Hall, about the time that he was president of this Society in 1832, that I wish especially

to direct your attention this evening, the meetings being then held at 28 Edward Street, Portman Square. Bloodletting was in full swing, both in London and throughout the kingdom, indeed through the whole civilised world. The *Cyclopædia of Practical Medicine*, edited by those three great physicians, Forbes, Tweedie, and Conolly, published in 1833, devoted a long article to the subject of Venesection, and it was accepted so much as a routine treatment that Dr. Marshall Hall, who wrote it, says: "General bloodletting is, of all our remedies, the most powerful; its employment requires the utmost consideration. If we neglect the remedy in cases, in which its use is required, we allow the disease to make a dangerous progress."

In 1844, Copland's *Medical Directory*, the next great encyclopædia of medicine, omits all reference to bloodletting, and, although the practice lingered a few years longer in the more remote parts of the country, this great and universal method of treatment, for upwards of two thousand years, fell into complete disrepute in the course of these twelve years.

The disuse was not confined to this country, but spread from it throughout Europe, and from France was carried to the United States of America by the bands of enthusiastic students who made Paris their headquarters about this time, and Louis their revered master. It is interesting, therefore, to ascertain why a remedy, thought to be so trustworthy, fell so quickly into disrepute. All unwittingly, Marshall Hall gives the full answer to the question. He says, "If our diagnosis were early and certain, perhaps the lancet would never be required." His *Researches principally relative to the Morbid Effects of Loss of Blood* were published by his friend W. Burnside, the publisher, in 1830, and the first thing that strikes us, in reading it, is the very deficient diagnosis of disease which was then common. The physical examination was not very thorough, and no instruments of precision were in use. There was no clinical thermometer, although it was used at Guy's Hospital at least as early as 1780, almost in its present form, but without an index. The stethoscope, invented by Laennec, was known to those who had studied in Paris, but was as yet very little valued, and it was a long time before it came into general

use. The laryngoscope, the ophthalmoscope, and test glasses for ametropia were absolutely unknown. Morbid anatomy itself, in spite of the work of Dr. Baillie, had made but very little progress, and, even in our largest hospitals, the arrangements for post-mortem examinations were most inadequate. The general practitioner treated symptoms, and, if a disease could be labelled inflammation, or its equivalents peritonitis, bronchitis, pleuritis, or arachnitis, the patient was bled. The medical profession had not advanced in the treatment of inflammation one whit beyond Thomas Cogan, who, in his *Haven of Health*, published in 1588, said, "I thinke there is none so blind or so impudent but will grant that a pleurisy is present death without bloodletting." Dr. Marshall Hall says definitely, "in the case of inflammation, no one would think of trusting the safety of the patient to any other remedy than bloodletting."

Some of these forms of inflammation, examined in the light of present knowledge, reveal interesting facts. Arachnitis, or a tendency to inflammation of the brain, we should now call either toxæmia from obstinate constipation, or eyestrain from uncorrected errors of refraction. We laugh at the boluses and glysters of our predecessors in the practice of medicine, but it is very difficult to realise the great prevalence of constipation amongst our forefathers. The days of *wagons lits*, lavatory carriages, and international trains have made us forget the difficulty of obtaining a regular action of the bowels when the coach only made short stoppages, the company being numerous and the accommodation limited and foul. The feeding, too, was gross, men aged rapidly, and died young. Women were deliberately prevented from taking exercise from their youth upwards. Dr. Marshall Hall tells us that "instead of having their health invigorated by a free and constant exposure to the open air, and by a regular plan of active exercises, young persons in the present day are enfeebled and disordered by a system of sedentary studies, pursued in warm and close apartments, an occasional walk in fine weather being taken merely as a sort of apology for the total neglect of what alone deserves the name of exercise. It thus happens that very few young persons escape the evil of a constipated state of the bowels, suspected or unsuspected."

When this constipation reached a maximum, and gave rise to symptoms of *sapraemia*, the condition was known as "arachnitis," "intestinal irritation," or "cerebral irritation resulting from intestinal irritation," and bleeding was at once adopted, sometimes with the administration of purgatives, but more often without. Dr. Marshall Hall gives the following account of the condition: "This affection consists of the irritation of indigestible food, *scybala*, or other morbid contents of the stomach or bowels, excited into activity by some shock of the system, or of the nervous system, such as a fall or other accident, parturition, etc.

"The symptoms are rigor, frequently severe heat of the surface and violent pain of the head, with intolerance of light and of sound, the symptoms, in a word, of acute encephalitis. The breath is tainted, the tongue loaded and swollen, the secretions morbid; but it would still be difficult to establish a distinct and confident diagnosis, without the criterion afforded by the effect of bloodletting in the erect posture. The first step to be taken in a doubtful case is very slowly to administer an enema of from three to three and a half pints of warm water, to examine the state of the *fæces*, and to observe the effect upon the disease and upon the system. If there be *scybala*, if the symptoms be subdued, and especially if there be faintishness, the case is indubitably not cerebral irritation but intestinal irritation.

"If the case still remain doubtful, the arm should be prepared, a vein opened, the patient placed upright, and the blood allowed to flow until the lips become pallid; if the case be encephalitis, an extreme quantity of blood will flow, even thirty or forty ounces, before there is any appearance of syncope; if it be intestinal irritation, syncope occurs before one-fourth of that quantity of blood has left the circulating system."

"I have insisted," says Marshall Hall, "so much upon a knowledge of this disease, and upon the nature of this diagnostic and guard against the undue and inefficient bloodletting, because this affection sometimes assumes a far less acute form. I met with such a case very recently. It had been mistaken for encephalitis. The patient slowly but perfectly recovered from attacks of vertigo, etc., by maintaining

a regular state of the bowels, diet, rest, and afterwards of gentle exercise, and change of air, etc."

To us of a later date and different upbringing, it would seem a much simpler matter to arrive at a diagnosis by a careful examination of the abdomen, followed by the introduction of the finger into the rectum.

The next case seems to me to have been a case of commencing presbyopia, associated, perhaps, with a little hypermetropia or astigmatism, causing eyestrain. Dr. Marshall Hall says: "Early in February, I was called to a gentleman, forty years of age, and very far from robust, suffering from deep-seated pain in the forehead, slight intolerance of light, a degree of quickness in his mode of speaking, and wakefulness, the state of the skin and pulse being natural. He had been bled to eighteen ounces the day before without its having produced either syncope, or relief to the pain and other symptoms. I directed him to be placed in the erect posture, and bled from a moderate-sized orifice until syncope should be induced. This prescription was repeated on the two succeeding days. The quantities of blood taken were twenty-six, twenty-four, and twenty-two ounces respectively, leeches having been applied, and the most energetic purgatives having been administered. The case was obviously one of inflammation of the encephalon, not of its most violent character. The quantities of blood taken on each of the four successive days were such as would not have been borne had not the tendency to syncope been far less than in health by the peculiar and specific action of the inflammation."

Dr. Marshall Hall endeavoured to reduce bloodletting to a system, but most practitioners were much less scrupulous, for (Sir) William Lawrence says plainly: "in cases of inflammation, where the blood runs freely out of the vein, I generally let it run on until it stops, for that seems to me the only way of doing good."

Dr. Hall's experience taught him that "persons in health and of moderate strength will generally faint, if bled in the erect posture, on taking fifteen ounces of blood. I have known seventy ounces to be taken in the sitting posture in the tendency to apoplexy without syncope; but the case is an extreme one. Patients with pleuritis, or pneu-

monia, frequently lose thirty-five ounces of blood without fainting. In bronchitis, little more is borne to be lost than in health. A stout person in fever will frequently faint on losing ten, twelve, or fourteen ounces of blood. In intestinal irritation, even with urgent symptoms, the abstraction of nine or ten ounces of blood will generally induce deliquium. In delirium tremens, or puerperal delirium, the patient soon faints from loss of blood. The same thing is still more observed in those cases of violent reaction which arise from loss of blood itself. In dyspepsia, hysteria, and chlorosis, the susceptibility to syncope from loss of blood is very great. And I have known a patient of good strength, affected with cholera, faint on taking four ounces of blood, although she had shortly before borne to lose nearly twenty ounces without fainting under the influence of an inflamed mamma."

Dr. Marshall Hall tabulated his rules for bleeding as follows :—

I. AUGMENTED TOLERANCE.—Represented by the mean quantity of blood which flows before incipient syncope :—

A. Congestion of the brain.

- | | | | |
|------------------------------|---|---|----------|
| (1) Tendency to apoplexy | - | - | } 3xl-l. |
| (2) Apoplexy from congestion | - | - | |

B. Inflammation of the serous membranes :—

- | | | | | |
|---|---|---|---|------------|
| (1) Arachnitis | - | - | - | } 3xxx-xl. |
| (2) Pleuritis | - | - | - | |
| (3) Peritonitis | - | - | - | |
| (4) Inflammation of the synovial membrane and of the fibrous textures of the joints | - | - | - | |

C. Inflammation of the parenchyma of organs :—

- | | | |
|-----------------------------------|---|---------|
| (1) Of the substance of the brain | - | } 3xxx. |
| (2) Pneumonia | - | |
| (3) Hepatitis | - | |
| (4) Inflammation of the mamma | - | |

D. Inflammation of the skin and mucous membranes.

- | | | | | |
|----------------|---|---|---|---------|
| (1) Erysipelas | - | - | - | } 3xvi. |
| (2) Bronchitis | - | - | - | |
| (3) Dysentery | - | - | - | |

II. HEALTHY TOLERANCE.—This depends on the age, sex, strength, etc., and on the degree of thickness of the parietes of the heart and is about - - - - - §xv.

III. DIMINISHED TOLERANCE.

- | | | |
|---|-----------|------------|
| (1) Fevers and eruptive fevers | - | §xii-xiv. |
| (2) Delirium tremens and puerperal delirium | - - - - - | §x-xii. |
| (3) Laceration and concussion of the brain | - - - - - | } §viii-x. |
| (4) Accidents, before the establishment of inflammation | - - - - - | |
| (5) Intestinal irritation | - - - - - | |
| (6) Dyspepsia | - - - - - | |
| (7) Cholera | - - - - - | §vi. |

Dr. Marshall Hall published his researches principally relative to the morbid and curative effects of loss of blood, in 1830, and it is evident that his remarks caused the more thoughtful physicians to reconsider their position in regard to bloodletting. In 1835, Ch. A. Louis published in Paris his *Recherches sur les Effets de la Saignée dans quelques Maladies inflammatoires*, and dedicated it "à Monsieur Marshall Hall, Professeur de Médecine pratique à Londres." The book deals more especially with the treatment by bloodletting of pneumonia, facial erysipelas, angina, and acute diseases. Louis arrived at the conclusion that inflammation cannot be cut short by bleeding, and that bleeding exercises very little influence upon the progress of the diseases in which he had studied it.

The views held by Louis were of much greater importance than those of any other teacher of his generation, except perhaps Andral and Chomel. He was the father of the modern method of notetaking, for he taught the value of signs and the influence of heredity, where his colleagues and predecessors were content to deal with symptoms and theories of disease. His method is well described by Prof. Bowditch, who was a pupil and a lifelong friend. He tells us that Louis was Perpetual President of the Society for Medical Observation, at Paris, which had been established, in 1832, by a few of his pupils.

The plan of the Society was to have weekly meetings, at which each member in turn was required to read an "observation," which had been recorded at the bedside. The members were ranged round a table, which occupied three sides of the room, and each person had a paper and pen or pencil before him. He was prepared to listen carefully to the reader, and equally prepared to note the most trivial omission, or too inconsiderate a deduction made by him. In turn, each subsequently criticised the papers from these notes. This was done in the keenest manner. Louis, as President, summed up the result of the meeting, not only by criticising the reader, but also the critics' remarks.

Dr. Bowditch recalls his own contribution. "How vividly do I remember the general effect of that evening, when I presented my first 'observation' and stood prepared to meet such criticism as I have spoken of! Though so long ago, it seems but as yesterday, that, having at last, after much labour and trial, succeeded, with the aid of my friend Bizot, in having rendered my case into good French, I took my place at the three-sided table above alluded to. I had in my anxiety been awake, and oftentimes engaged in writing, during much of the previous night. Of course, this foolish proceeding did not tend to make me calmer as I approached the ordeal. I got through with the reading well enough for an American, who was not quite skilled in the tripping, light language of France, and doubtless with many a slip in the proper intonation, often, I knew, provocative of an internal smile, but which those around me were too polite to express upon their faces. But the reading was a small matter, compared with the subsequent judgment of that Rhadamanthine court, as it almost seemed to me, when fairly brought before it. I had ceased reading, and Louis had proceeded to ask each member in turn to state the errors he had noticed in the paper. With this commenced a running fire of criticism of the severest kind. All of it was made in the most gentlemanly manner, and evidently in no captious spirit, but simply with the determination to make as much out of the occasion as could be made towards the clearest elucidation of the subject. Of course, I had neglected many common questions, which adepts felt necessary. These I admitted frankly. But when one book-

worm seized upon me, and held me up as neglectful of duty because I had not made my 'observation,' by a more proper and more careful questioning of my patient, elucidate some distant relation which the disease in question bore to another; or when a second member quietly remarked that such a writer, naming him, of whom perhaps not one other member of the Society had thought, had suggested so and so, and that I had absolutely neglected to offer any answer to that important matter, after such remarks I, of course, was dumb."

"All the members having thus given their views, our President, Louis, took up the subject, and, after rapidly reviewing what had been said by others, so far as he thought necessary, finally came down upon me like a discharge of one of the far-famed mitrailleuses upon the body of an enemy. If my compeers had hit hard with their random shots, he would, it seemed, annihilate me, as in fact he did finally on one of my points, viz.: that 'because I had not carefully examined one side of it, I might as well have omitted all reference to the subject.' And with this our meeting ended, and I was heartily congratulated on the result. My subsequent experience in the Society proved that this kind of treatment was readily borne by all the original members, composed as they were of a company who had united for that very purpose, and knew what they were to undergo. None among them ever allowed any sentimental delicacy towards a reader to prevent him from noticing anything deemed erroneous or wanting in any paper; at the same time, there was no petty quibbling, no personal attacks, and all bore good-humouredly any remarks, however severe. I am not aware that any member ever left the parent Society in consequence of that severity."

The lectures, given in the Paris Amphitheatre at this time, were delivered to an audience of two or three thousand students, drawn from all parts of Europe and America. The audience was critical to a degree, and apt to express its feelings without reserve, but the general conclusion arrived at was that Louis was "a very remarkable man, wholly different from the physicians of England and America, and remarkable even at Paris by the strict mathematical accuracy

with which he arrived at his results." He was never a facile lecturer, but he attracted the best students of the time. They flocked to his clinic at La Pitié, and the views he taught, based as they were on truth and observation, were soon reflected throughout the world. It is not surprising, therefore, that when Louis, stimulated by the work of Marshall Hall, had pronounced against bloodletting, the whole question should be actively canvassed. When serious attention was drawn to the matter, it soon became a thing of the past. How quickly this happened is shown by the bill for leeches at St. Bartholomew's Hospital: no less than 97,300 were used in 1832; only 48,100 were required in 1842. Last year 400 were bought, and the annual purchases, for some years past, have never exceeded 1,000.

Marshall Hall and Louis were not, of course, the only opponents of treatment by bleeding. I doubt indeed whether Marshall Hall was not in favour of venesection until the day of his death. But I have endeavoured to show that Marshall Hall was one of the earlier and important members of the profession to throw doubts upon the indiscriminate bloodletting, which was a feature of medical practice at the time he was acting as President of this Society.



UTERINE HÆMORRHAGES.¹

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[With Plates II.—III.]

FROM whatever source derived, hæmorrhage always attracts attention; in some cases it excites alarm, and it may occasionally even prove of fatal import. In the whole range of medicine, however, there is no variety of hæmorrhage which is possessed of characters so unique as those shown by hæmorrhage from the uterus. In the first place, uterine hæmorrhage may be either physiological or pathological, whereas bleeding from any other source, and under all other conditions, must of necessity be a pathological occurrence. Again, the practitioner, no matter what branch of medicine he may profess, cannot, in dealing with his female patients, either ignore or neglect to take account of the physiological variety of uterine hæmorrhage, namely, menstruation, along with any departure from the normal which it may exhibit. Further, the specialist in women's diseases is fully aware that, both in obstetrics and in gynæcology, there is no single symptom possessed of such importance and of such significance as hæmorrhage, which in the vast majority of obstetric and gynæcological cases, is provided by the uterus.

Since, then, uterine hæmorrhage may be either a physiological or a pathological condition, it behoves us to consider it as a physiological condition before proceeding to discuss its pathological varieties; in other words, we must first turn our attention to the physiology of menstruation.

Menstruation.—During active sexual life, that is to say, during the reproductive period of a woman's life, there is a periodic discharge of blood from the uterus, which (its periodicity in the great majority of women being monthly) is known as menstruation. This periodic menstrual hæmorrhage is associated with a well-marked wave of vital energy, which manifests a similar periodic fluctuation of the body

¹ A Paper read before the West Kent Medico-Chirurgical Society.

temperature, of the pulse rate and tension, and of the daily excretion of urea, as well as of certain nervous and vascular phenomena—all indicating a periodicity of general metabolism, of which the menstrual discharge is the outward and visible sign. The menstrual discharge, when fully established, consists of thin dark fluid blood, somewhat resembling prune juice, possessed of an alkaline reaction, and a peculiar heavy odour. In health it is said to be prevented from clotting by the admixture of alkaline mucus. When examined microscopically, red and white blood corpuscles are seen in it, together with columnar and cubical epithelial cells from the uterine mucosa, and squamous epithelial cells from the vagina.

When we attempt to discover the source of hæmorrhage, as revealed by histological examination of the mucosa of menstruating uteri, we find that only recent observations can be trusted to give us accurate information. Previous observations were at fault in the technique of preparing the sections, in the use of material which had undergone post-mortem changes, and which showed the degenerative changes produced by infectious and chronic wasting diseases.

More recent observers, avoiding these sources of error, have clearly demonstrated that it is not accompanied by shedding of the endometrium, either complete or partial, and that the loss of epithelium is purely accidental and strictly limited.

Thus Gebhard classifies the anatomical changes into three stages :—

1. The stage of pre-menstrual congestion, in which the capillaries of the endometrium are congested; a serous or sero-sanguineous exudate infiltrates the stroma, widening the intercellular spaces; later, the blood leaves the capillaries and infiltrates the stroma, gravitating in the direction of least resistance, *i.e.*, towards the uterine cavity, and forming a collection of blood beneath the surface epithelium, which is, in places, lifted off its bed, such collections being termed sub-epithelial hæmatomata.

2. The stage of active hæmorrhage, in which the blood in the sub-epithelial hæmatomata is forced between the epithelial cells into the uterine cavity; here and there the continuity of the surface is broken, and bits of epithelium are accidentally

broken off and carried away in the menstrual discharge. Blood may also find its way into the gland lumina.

3. The stage of post-menstrual involution, in which the blood-vessels become less engorged; blood is no longer extravasated into the connective tissue spaces; the blood left in the stroma is slowly absorbed; the surface epithelium, lifted from its bed, resumes its attachment to the parts beneath, and the lost epithelial fragments are rapidly regenerated from the adjacent epithelium.

It will be seen that the hæmorrhage in menstruation is produced by a diapedesis of the red corpuscles through the walls of unruptured capillaries.

Uterine hæmorrhage possesses further interest when considered according to the age at which it occurs, and its relation to those great epochs in a woman's life—puberty and the menopause.

Metrostaxis of the New-Born.—It is not unusual to observe a slight hæmorrhagic or muco-sanguinolent discharge from the vagina in full-term healthy girl babies, a phenomenon which may be termed *metrostaxis neonatorum*. Nurses and mothers are often unduly alarmed at its occurrence. It is, however, usually a matter of little significance and soon ceases. It is said to be due to the occurrence of pelvic, and therefore uterine, congestions, which result from ligature of the umbilical cord. The application of a boric-acid lotion provides all the treatment needed. In some instances, however, this phenomenon has foreshadowed precocious menstruation and early sexual development. In these quasi-menstrual cases the hæmorrhage occurs a short time after birth and lasts what would appear to be a menstrual period, but does not make its appearance in the following month.

In other cases, however, it appears to possess a sinister meaning, for it has been noted as a terminal phenomenon in infants dying soon after birth, especially premature infants. Such cases may be due to a general infection of doubtful or cryptogenetic origin, as suggested by a case of Doleris', in which he cultivated staphylococci from a co-existing pericardial effusion.

Precocious Menstruation.—The average age for the commencement of menstruation varies somewhat according to race

and climate. Thus, in temperate climates, it usually occurs in the fifteenth year, whilst, in India, it is stated to be the ninth year, and in Iceland it is given as the sixteenth year. When menstruation occurs earlier than the normal age for its onset, it is spoken of as precocious or premature menstruation.

It has been recorded in very young infants, as in a case of Montanaier's, in which menstruation occurred in a child less than six months old, with very large and well-developed breasts. One of the most remarkable and most often quoted cases of this class is one of De Beau's, to the report of which he considered it advisable to append the signatures of four physicians, a mayor, and a British Consul.

The history of the case reads thus :—" Matilda H. was born on 31st December 1829. She came into the world with her *mammæ* perfectly formed, and the *mons veneris* covered with hair as much as a girl between 13 and 14 years old. When precisely three years old the *catamenia* made their appearance, and have continued to appear regularly every month until the present time, and as copious as any woman might have them, each period taking four days. . . . Her *mammæ* are now of the size of a full-grown orange, and the dimensions of the pelvis are such as to enable her to bear children when eight years old, and very likely sooner."

Precocious conception may also occur in cases of precocious puberty, even as early as the ninth year.

Of the cause of precocious puberty, little is known, but, in a few cases, it has been associated with the presence of pelvic tumours, *e.g.*, ovarian cysts. On the other hand, I have assisted to remove an ovarian cyst of the size of a cocoanut in a girl, aged 10, in whom there were no signs of precocity. Several cases of sexual precocity have been recorded associated with hypertrophy and tumour formations of the suprarenal capsules; whereas atrophy of these bodies is associated with non-development of the pubic hair and genital organs. It would seem, therefore, that the suprarenal capsules are essential for the growth of the body, and the development of puberty and sexual maturity.

The Hæmorrhages of Puberty.—As regards the menstrual flow, every woman is a law unto herself, regarding its periodicity, duration, and amount of the flow. What would be

regarded as normal in one woman would be excessive in another. The flow can only be considered to be abnormal in amount if the health is affected thereby, or if it differed from the type previously existing.

At its onset, and until thoroughly established, the menstrual function may be somewhat irregular, usually on the side of deficiency than of excess. When excessive it is usually due to a functional congestion attendant on puberty, and soon becomes normal. In some cases, however, there may be much more severe hæmorrhage as in the following case, recorded by Wall (*Journ. of Obstet. and Gynec. of Brit. Emp.*, 1904, Vol. V., p. 38):—

Hilda P., æt. 13½ years, began to menstruate in Aug. 1902. Two ordinary periods were followed by a scanty one. The fourth period began in December, and continued almost uninterruptedly until seen in consultation in April 1903. The hæmorrhagic discharge was very copious, and often contained small clots. The general treatment consisted of rest in bed with cold diet. Various medicines had been given, mostly of little avail, the most satisfactory being m. ferri sulph. c. magnes. sulph., whilst ergot seemed to increase the hæmorrhage. Hot douches were without benefit. Examination of the uterus revealed no abnormality. Curetting was performed, followed by gauze plugging. The hæmorrhage continued in milder form for a fortnight and then ceased. Afterwards the periods were normal. The ætiology of this case is somewhat obscure. There were no signs of retained products of conception, and no history of infection or of hæmophilia. It probably belongs to the class of cases described by Donald as "idiopathic endometritis."

Cases of this description are distinctly rare; personally I have never seen one of such severity as the one described by Wall.

The Hæmorrhages of Adult Sexual Life.—Menstruation, having once been thoroughly established in the normal manner, may then become a pathological phenomenon by reason of the flow becoming excessive in duration and amount. Such a condition is known as menorrhagia. Again, uterine hæmorrhage may occur during menstrual life independent of menstruation, when it is known as metrorrhagia. Often, however,

hæmorrhage from the uterus may become so irregular that all count of the menstrual period is lost, and it is then impossible to distinguish between these two conditions, and the term metrostaxis may then be applied to the hæmorrhage. Still, for clinical purposes, it is useful to distinguish between menorrhagia and metrorrhagia, for, as Dr. A. E. Giles points out, "we must emphasise one highly important distinction between the two, and it is this: while menorrhagia may be due merely to functional congestion, *metrorrhagia is invariably due to some form of new growth*, ranging from a simple polypus to an advanced carcinoma. From this generalisation we deduce an equally important rule of practice, namely:—*It is permissible, under certain conditions, to postpone a local examination in a case of menorrhagia; but, in a case of metrorrhagia, an examination must invariably be made at the earliest possible moment.* This rule admits of no exceptions, and any failure to carry it out throws a very serious responsibility on the medical attendant, unless the patient takes on the whole responsibility by refusing permission for an examination."

As to the causes of uterine hæmorrhage in the adult, one must not forget that it may be brought about by certain general diseases, which produce pelvic congestion, such as heart disease, hepatic cirrhosis, etc., and that a general medical examination of the patient should always be made in investigating such cases.

General diseases being excluded, we have now to look to the pelvic organs, and especially to the uterus itself, for the cause, and in this category we have two great groups, namely:—(1) Puerperal hæmorrhages, including all hæmorrhages which occur in connection with pregnancy; and (2) non-puerperal, from which pregnancy can be excluded.

Puerperal hæmorrhages, again, include:—(1) those cases in which hæmorrhage is derived from some source which would cause hæmorrhage apart from pregnancy: for example, cancer of the cervix will produce a hæmorrhagic discharge in a woman, either pregnant or non-pregnant; and (2) hæmorrhages due to pregnancy. These may occur either in pregnancy, or before or after labour. The hæmorrhages of pregnancy may be early or late. The early hæmorrhages of pregnancy

include abortion, whether threatened, inevitable, incomplete, complete, or missed, and moles, both carneous and hydatidiform.

Late in pregnancy, the hæmorrhages are familiar as ante-partum hæmorrhages, viz. :—accidental, concealed and revealed, and unavoidable, due to placenta prævia. Post-partum hæmorrhages include the primary and secondary varieties. After either abortion, or full-time labour, hæmorrhage may be due to subinvolution, to retained products of conception, and its sequel, syncytioma malignum, especially after hydatidiform mole.

I do not propose to consider any of these forms, but pass on to the non-puerperal hæmorrhages.

Many varieties of non-puerperal hæmorrhage occur, and may be either of general or of local origin. Those of local, *i.e.*, pelvic, origin may be classified as follows :—

- | | | | |
|-------------------|---|---|-----------------|
| (a) Uterine | - | - | { Congestive. |
| | | | { Inflammatory. |
| | | | { Neoplastic. |
| (b) Extra-uterine | - | - | { Inflammatory. |
| | | | { Neoplastic. |

There are two rather rare causes of uterine hæmorrhage, namely, adenomyoma of the uterus, and chronic metritis, to which I wish to draw especial attention.

Adenomyoma.—Adenomyomata of the uterus cause both profuse and painful menstruation. They form a variety of tumour *sui generis*, which have only been recognised in this country since 1904, when attention was drawn to them in a paper which I published in conjunction with Dr. S. Cameron in the *Journal of Obstetrics and Gynæcology of the British Empire*, and which were probably previously considered to be diffuse fibroids. They differ from fibromyomata in being diffuse and unencapsuled, and in consisting of glandular elements surrounded by a richly cytogenic lymphadenoid connective stroma embedded in fibro-muscular tissue, so that the histological picture, which they present, is strikingly different from that of an ordinary fibroid. I have seen seven or eight examples among about six hundred myomata which I have examined. Kelby has observed about forty cases among fifteen hundred myomata.

The first case to come under my observation gave the following history :—

A married woman, aged 49, was admitted on January 22nd,

1903, into Chelsea Hospital for Women. As a child she was delicate. Menstruation commenced at the age of 13, and was always regular until between two and three years previous to admission. At, and for some time subsequent to, the onset of menstruation, there was a great deal of pain at the periods, but of late years there had been very little pain. There had been gradually progressive menorrhagia for between two and three years, the loss becoming very profuse, and latterly containing large clots, whilst for the last five weeks there has been profuse metrorrhagia. She has had four children, two miscarriages, and two "false conceptions," the last pregnancy being six years previously. There was some leucorrhœa for twelve months. Patient has become more and more anæmic, with increasing metrorrhagia.

Abdominal examination revealed nothing abnormal. Vaginally, the uterus was found enlarged, firm, and freely mobile, as if occupied by a fibroid tumour. There was some "erosion" of the cervix, and some sanguineous vaginal discharge.

The diagnosis of fibromyoma of the uterus was made, and abdominal hysterectomy was decided upon. This operation was performed on January 26th, the whole uterus, except for a very thin shaving of cervix, along with both uterine appendages, being removed. Recovery was rapid and uneventful, and the patient left the hospital cured on February 14th.

The removed uterus measured 5 by $3\frac{1}{4}$ by $2\frac{3}{4}$ inches, and in shape closely resembled a normal but enlarged uterus, and was considered to be an ordinary interstitial fibromyoma.

On section, however, the uterine walls were found to be uniformly thickened and composed of firm pink tissue. There was no sign of an encapsuled tumour, except just beneath the peritoneum, where there was a small encapsuled fibromyoma $\frac{1}{2}$ by $\frac{1}{4}$ inch in diameter.

The uterine wall was $1\frac{1}{4}$ inches thick and could be readily differentiated into three layers, from within outwards:—first, a thin layer of spongy, rather ragged endometrium; secondly, a mass of spongy-looking, coarsely striated tissue with striæ running in all directions, and not presenting the characteristic whorled appearance so typical of fibromyoma; and thirdly, a layer of apparently normal uterine muscle about $\frac{1}{3}$ inch in thickness. Both uterine appendages showed old-standing chronic inflammatory changes.

Histologically, the bulk of the 'tumour was composed of bundles of plain muscular tissue, interspersed amongst which are gland tubules embedded in a mass of richly cytogenic lymphadenoid connective tissue. The gland tubules and surrounding stroma resemble those of the endometrium, the direct continuity with which can be distinctly traced. The external, $\frac{1}{8}$ inch, is composed entirely of plain muscle fibres, and shows no traces of glandular elements.

I was soon afterwards confronted with a second case, the patient being a single woman, aged 35, whom I saw in consultation with Dr. J. D. Stubbs, of Brixton Hill, in February 1905. She complained of pain in the back and in the lower abdomen, and of irregular, excessive, and painful menstruation, having been unable to work for twelve months.

Menstruation commenced at the age of $14\frac{1}{2}$, and was painful from its onset, but at first was regular as regards duration, periodicity, and quantity. There was a progressive increase in the duration and amount of the flow until August 1904, when the patient was curetted in Westminster Hospital. As this was without effect, a second curettage was performed the following October, and a vaginal pessary was inserted. Very little improvement also followed this operation, patient having continued in pain and the menstrual periods were of longer duration, and were followed by a copious vaginal discharge. Micturition was frequent and the bowels were constipated.

Thoracic and abdominal examination revealed nothing abnormal. Bimanually, the uterus was felt to be slightly enlarged, with somewhat impaired mobility, and one small nodule was felt on the surface of the uterus. The diagnosis of multiple small fibroids was made, one being submucous and causing the hæmorrhage. As drugs, rest, and two recent curettings had been without avail, hysterectomy was advised.

The patient was admitted into the Chelsea Hospital for Women, where Mr. Bland Sutton opened the abdomen and removed the uterus by subtotal hysterectomy. Both appendages being healthy were left behind. Recovery was satisfactory, the wound healing *per primam*.

The appearance of the uterus can be gathered from the accompanying figure.

The localised mass of growth in the wall of the uterus is

PLATE II.



Fig. 1.—*Adenomyoma of uterus forming diffuse growth in uterine wall. A small fibroid projects on surface of uterus. (Natural size.)*



Fig. 2.—*Adenomyoma of uterus. Section of growth showing glands and cellular stroma surrounded by unstriped muscle. ($\times 60$.)*

PLATE III.

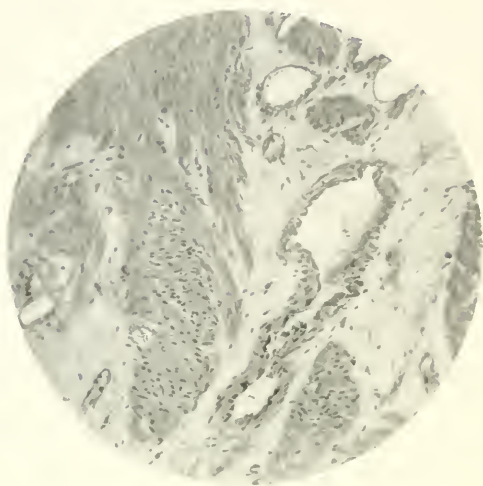


Fig. 3.—*Fibrosis of uterus. Section of muscular wall of uterus showing increase of fibrous tissue (lightly stained). ($\times 100$.)*

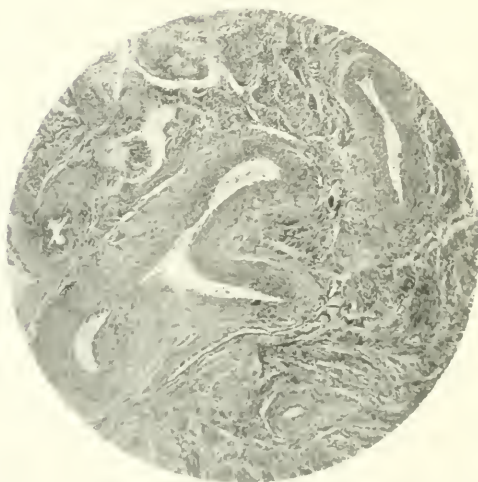


Fig. 4.—*Fibrosis of uterus. Section of muscular wall of uterus showing fibrous thickening in the walls of the blood vessels. ($\times 30$.)*

readily seen. It consists of a spongy-looking tissue, and shows no trace of encapsulation. On section of the tumour when fresh, the small lacunæ could be observed, and from them could be squeezed a little chocolate-coloured fluid, distinctly suggestive of retained menstrual fluid. Histologically, the neoplasm shows the characteristic structures of an adenomyoma, being composed partly of adenomatous tissue which exactly resembles the endometrium, and partly of unstriated muscular tissue, the two elements being intermingled in interlacing bundles.

Howard Kelly points out that "the glands of the adenomyoma differ in no way from the normal uterine glands, consequently they retain their menstrual functions and may accumulate menstrual flow from numerous periods," and the glandular spaces may form cysts "with a muscular wall lined by typical uterine epithelium, and filled with chocolate-coloured menstrual contents. There is an increased menstrual flow as the area of the uterine mucosa increases." Also, "the rationale of the painful menstruation is manifestly in the scattered islands of mucous membrane, which swell during the menstrual period, increasing the size and tension of the organ, and giving rise to the discomforts associated with the condition."

Chronic Metritis.—The second condition to which I refer is usually known as chronic metritis, a somewhat unusual condition, in which intractable hæmorrhage occurs, which resists alike drugs and curettage, and in which there is no gross uterine lesion. It occurs in both multiparæ and nulliparæ, of ages from 20 to 55, the average being well below the average age of the menopause.

The uterus is increased in size, and, on section, its walls are thick, pale pink, and firm, and the arteries are sometimes seen to stand out prominently. The endometrium shows no marked thickening. Histological examination distinguishes two distinct varieties, with intermediate stages, namely:—(1) *The arterio-sclerotic type* in which the vessels are thick-walled, the increase being chiefly due to increase of fibrous tissue in the tunica media of the arteries; and (2) *the fibrotic type*, in which there is an increase in the intermuscular fibrous tissue, with or without any hypertrophy or hyperplasia of the muscle cells.

The condition is usually ascribed to remote septic infection

of the uterus, but the ætiology of the condition is by no means clear. In the severest cases nothing short of hysterectomy will arrest the hæmorrhage and save the patient's life.

The history of a single case must suffice :—M. M. P., aged 33, was admitted into Chelsea Hospital for Women under Dr. W. H. Fenton, on November 26, 1907, complaining of excessive hæmorrhage and vaginal discharge. She had been married 10 years, and had had 11 pregnancies, the first at full term, 8½ years previously ; then followed three premature labours and the seven miscarriages, the last being in July 1907.

She says that she had trachelorrhaphy and perineorrhaphy performed several times, and has been curetted ten times—twice in Guy's Hospital, once each at the Samaritan and the Tunbridge Wells Hospitals, the remainder in private. The bleeding began six years ago, after her second confinement, and has been especially severe during the last two years, having had profuse losses lasting three, four, and six weeks at a time. She was extremely anæmic. There was great frequency of micturition. The patient had also had gastric ulcer at 18, and inflammation of the ovaries 17 months ago.

Examination of the thorax and of the abdomen revealed nothing abnormal. Bimanually, the uterus was normally situated and somewhat enlarged, the cervix was lacerated, and the uterine appendages appeared to be normal. The diagnosis of fibrotic uterus was made, and the uterus was removed abdominally by supra-vaginal amputation. The appendages, being normal, were left *in situ*. The abdomen was closed in three layers, Michel's clips being used instead of skin sutures. The wound healed by primary union, but there was an irregular temperature ranging from 98·4° to 100·6° until her discharge from hospital, without any obvious cause, the cervical stump being freely movable, and pelvic symptoms being absent.

Climacteric and Post-Climacteric Hæmorrhages.—I have now no time to discuss the significance of these hæmorrhages in all their varieties ; so will restrict myself to climacteric and post-climacteric hæmorrhages, as an indication of malignant disease.

It is a pernicious and widespread doctrine, especially amongst the laity, that the menopause is naturally associated

with irregular and excessive hæmorrhage. Nothing could be farther from the truth, for excessive and irregular losses of blood from the vagina about the time of the change of life, and any, even the slightest, post-climacteric hæmorrhage, is exceedingly suggestive of malignant disease, of which it is the earliest and most constant symptom.

To give any chance of curing cancer, whether it is in the uterus or elsewhere, early and wide removal is absolutely essential, and, in order to ensure early removal, early diagnosis must be made. At present a sufficiently early diagnosis of cancer of the uterus, however, is seldom arrived at, with the result that 4,000 women die annually of this disease in this country alone. If this sad state of affairs is to be remedied, the early diagnosis of cancer of the uterus must be made. Women must be taught that irregular bleeding is not a natural phenomena of the climacteric, and that any post-climacteric hæmorrhage is usually a danger signal. The practitioner, too, must have this condition constantly before his mind, when dealing with elderly women. He must more thoroughly realise the significance of these hæmorrhages, and insist on the examination of patients who suffer from them. If no sign of carcinoma is discovered, and the hæmorrhages still continue after appropriate treatment—namely, the administration of hæmostatics: ergot, quinine, and styptol—has been undertaken for a short time, then the aid of the microscope and a competent pathologist must be invoked. For this purpose, the uterus should be curetted, and the cervix curetted, or a small piece chipped out; and the curettings, or snips, should be submitted to microscopic examination. The majority of practitioners are not yet fully alive to the value of a microscopic examination in the early diagnosis of cancer of the uterus.

When early cases, in which the diagnosis has been made in this way, are submitted straightway to operation, we shall hope for better results than are at present obtained. Where, however, uterine hæmorrhages are ignored, and other symptoms are awaited, such as profuse purulent discharge, loss of flesh and strength, pain, and cachexia, and an obviously malignant mass or ulcer is present, the prospect of radical extirpation of the disease is hopeless, palliative measures only can be undertaken, we can only utter those woeful words: "too late."

ACUTE INFECTION OF THE KIDNEY BY
THE BACILLUS COLI COMMUNIS.

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DURING the last few years attention has been directed, with increasing frequency, to the rôle played by the bacillus coli communis in infective inflammations of the urinary tract. It is to that type, where the kidney and the pelvis of the ureter are chiefly involved—acute pyelonephritis—that the following remarks are particularly directed.

As a preliminary to a general discussion of this condition, a short account of two cases which have come under the writer's notice will be given.

Case I.—A woman, aged 33 years, was admitted to the Ancoats Hospital under my care on January 27th, 1908. Her illness began a fortnight before admission, as an attack of severe pain in the lower abdomen, accompanied by frequency and urgency of micturition, and, shortly after, vomiting set in.

A few days later, the pain in the abdomen and the disturbance of micturition subsided; but the patient still continued to be seriously ill, and developed pains and tenderness in the left loin. Beyond the occurrence of rigors, a few days before admission, no other symptoms appeared.

On admission, the patient was gravely ill. The temperature was 102° F., the pulse rate was 128, and the respirations 24 to the minute. There was well marked tenderness and rigidity in the left loin, and the kidney was enlarged, and occupied a very low position. Tenderness was elicited by pressure over the left costo-vertebral angle. The right kidney was also lying at a lower level than usual, but was neither enlarged nor tender.

There was a leucocytosis of 18,000.

The urine was pale and turbid, and small flocculi were floating in it. The reaction was acid, and the specific gravity was 1010, and it contained a trace of albumin, but no blood. Microscopically, a large number of leucocytes were seen, for the most part congregated into masses, and among them were large numbers of bacilli, mainly agglutinated into masses, though some were lying singly. The bacilli varied in length, and, in some cases, formed jointed rods. Stained preparations showed that they were Gram negative. There were no casts and no red blood corpuscles to be seen, and it was noted that phagocytosis had not taken place to any extent in the urine. By cultivation a pure culture of the bacillus coli communis was obtained. Three days after admission, as the patient seemed to be losing ground, the kidney was exposed from the loin under chloroform anæsthesia. The organ was much enlarged and congested, but no subcapsular hæmor-

rhages or miliary abscesses were present, and therefore nephrotomy was performed, and the pelvis drained. At first there was no decided improvement, but after three or four days, a gradual fall of temperature set in, and the patient made a slow recovery.

Her condition once or twice gave rise to serious anxiety, and on February 11, about a fortnight after the operation, she had a slight attack of aphasia, lasting about two days, which was probably uræmic. After this a steady improvement set in, and the patient was discharged on March 7 in good health, though the urine still contained some pus. When she came up for examination some weeks later, the urine contained no pus and was sterile.

Case II.—For the notes of this case, I am indebted to Dr. Ilderton, junr., of Fairfield, who kindly supplied me with a specimen of the urine.

The patient, a girl, aged 13, developed an ordinary attack of measles on February 24, 1908, which progressed in the usual way until March 6, when she began to suffer from pain on micturition shooting up to the left loin. Associated with this was great frequency of micturition. The pain rapidly settled in the left loin, which became very tender to the touch. The child complained much of headache, and the pulse rate was 120 to the minute, and the temperature 102° F. The urine was turbid, very foul smelling, and contained albumin and some pus. Shortly afterwards the pain in the left loin subsided, and similar changes appeared on the right side. For some time after this, the inflammation kept subsiding on one side and reappearing on the other, and, with each fresh infection, the temperature and pulse rate rose; but the attacks became gradually less severe, until May 6, when the child was practically in her normal health.

A specimen of the urine of April 16, kindly supplied to me by Dr. Ilderton, was turbid, and contained a good deal of mucus. It was slightly alkaline in reaction (the patient had been taking citrate of potash), and had a most peculiar, foul odour. It contained neither albumin nor blood. Microscopically, no leucocytes, blood corpuscles, casts, or bacteria could be seen, but a pure culture of the bacillus coli communis was obtained by cultivation.

The clinical manifestations of this condition have become definitely established. Occurring usually in females, and not infrequently associated with pregnancy, the onset of the symptoms is acute, the temperature rising suddenly, often with a rigor, and associated with this there is severe pain in the back, generally limited to one side. It is interesting to note that, in some instances, it is possible to trace a rapidly ascending inflammation of the urinary tract, the onset being attended by scalding pain and frequency of micturition, with pain above the pubes, indicating the occurrence of an initial cystitis. In such cases, the pain in the back does not set in for some days.

When the disease has become well established, the patient is gravely ill, the pulse being rapid, and the temperature

varying from 102° — 105° F. There is severe pain in the back and loin, generally on the right side, and palpation reveals well-marked tenderness and rigidity in this region, and the kidney is enlarged and exquisitely tender. Tenderness in the costo-vertebral angle was found by Brewer to be invariably present. Vomiting is frequent, although definite uræmic symptoms are not frequently met with. The condition closely simulates influenza or acute appendicitis, and the moderate leucocytosis (about 18,000—24,000) which is present may lead to still further confusion with the latter disease.

The urine presents changes of great diagnostic importance. Generally acid in reaction, occasionally amphoteric, very rarely alkaline, it is turbid, containing an excess of mucus and little flocculi. At times, however, it may be clear. Albumin is present in the majority of cases, generally a mere trace, particularly in the early stages, but may be present in considerable abundance. Hæmaturia is not nearly so constant a feature as is albuminuria, being frequently absent, at other times made manifest by the presence of a few red blood corpuscles, while, in rare cases, fairly profuse bleeding may occur. Microscopical examination reveals the presence of pus cells in varying abundance, and, in many instances, bacilli can be also seen lying, as a rule, between the cells, as phagocytosis does not take place to any extent in the urine, a fact pointed out by Dudgeon. Agglutination, on the other hand, frequently occurs. Cultivation of the urine yields a pure growth of the bacillus coli even in those cases in which microscopical examination of the urine fails to reveal its presence.

Casts were described as constantly present by Barnard, and French found granular casts in his cases of the pyelonephritis of pregnancy. Dudgeon, on the other hand, states that he has never seen casts in uncomplicated cases. Probably their presence is an indication of the severity of the renal affection. When present, they are usually of the granular variety.

The changes produced in the kidney by this disease have been studied from specimens removed by nephrectomy and at post-mortem examinations, and, in consequence, the descriptions given apply only to the most severe lesions. It is not to be doubted that less severe inflammation is present in cases which recover without surgical interference, and no

evidence of renal suppuration has been found on several occasions when the kidney has been exposed by an exploratory incision. The kidney is always enlarged, sometimes attaining to almost double its normal size. There is intense congestion, seen especially in the stellate veins, and subcapsular hæmorrhages are a marked feature in advanced cases. Numerous yellow nodules, surrounded by an area of intense congestion occur under the capsule, which on section are found to be the bases of small wedge-shaped areas of suppuration, extending through the cortex and terminating in the outermost parts of the pyramids. Barnard found submucous hæmorrhages in the pelvis.

According to Brewer, the microscopical changes consist in a diffuse degeneration of the renal epithelium, while, in the wedge-shaped areas, the glomeruli and tubules, and, to a less extent, the stroma, are crowded with leucocytes. In a child, aged 3 years, the appearances suggested an ascending infection, the tubules near the pelvis being dilated and containing many pus cells. There was a moderate amount of leucocyte exudation in the stroma, and the tubular epithelium showed some degeneration, especially in the convoluted tubules. Barnard describes a condition of acute tubular nephritis, and states that the wedge-shaped areas of inflammation are in the bundles of tubules forming the lobules, and not surrounding the vessels.

A section of the kidney in Case I., described above, showed cloudy swelling and degeneration in the epithelium of the convoluted tubules, with an abundant exudation of leucocytes in the stroma, particularly in that surrounding the straight tubules. The lesion, in this instance, was less advanced than in the cases described by Brewer and Barnard, insomuch that there was no miliary abscess formation, although, in one part of the section, there was an area where the leucocytes were so abundant as to suggest an early stage of an abscess. It was not possible to demonstrate the presence of bacilli in the section. To the naked eye, the kidney was much enlarged and congested, but no subcapsular hæmorrhages, and no miliary abscesses could be seen.

There are several very interesting problems connected with this condition, the first of which is the sex incidence. Even

when we exclude those cases arising in connection with pregnancy, the great majority are females. Brewer collected 13 cases, 11 being females and 2 males. Of the two cases published by Barnard, one was a male and the other a female. Bond reported 3 cases, one of which was a pregnant woman, and must therefore be excluded. The other two were men; while both of the writer's cases were females. Thus, out of a total of 19 cases, 14 were females and 5 males. So far as I am aware, no adequate explanation of this fact has been put forward by the advocates of the theory of hæmatogenous infection. Barnard explained it from the standpoint of an ascending infection on the grounds that the female urethra is shorter and more patent than the male, and is in closer proximity to the anus, and therefore more liable to be infected by the bacillus coli communis.

Another fact of much interest, which applies equally to those cases developing during pregnancy, is the greater frequency with which the right kidney is affected. French explains this, in the pyelonephritis of pregnancy, as being due to obstruction of the right ureter by pressure against the pelvic brim, produced by the greater development and the inclination and rotation of the uterus to the right as pregnancy progresses. No such factor of course is present in cases not associated with pregnancy, and the cause of the predominance of right-sided inflammation in non-pregnant individuals is still to be found. In this connection, it is interesting to note that, in the case operated on by the writer, the left kidney was affected, and lay at a much lower level than usual. In view of the greater frequency with which the right kidney is mobile, a possible explanation may be sought in kinking of the ureter from mobility of the kidney—an explanation which would apply equally to the sex incidence, and the predilection for the right kidney.

Although the bacillus coli communis is by far the commonest cause of unilateral renal inflammation, a similar condition may arise from infection with other organisms. Brewer points out that unilateral renal suppuration has been found in association with the streptococcus, staphylococcus aureus, pneumococcus, and typhoid bacillus by Israel, Alter, Singer, Comba, and others, and the writer had a case under

his care in which a pure culture of the staphylococcus aureus was obtained from the urine.

Perhaps the most interesting problem connected with this condition is the route by which the invading organism reaches the kidney, and the evergreen controversy between infection by the blood-stream and ascending infection along the duct has arisen. This question invariably arises when the septic inflammations of any gland provided with a duct are studied, and the problem is as difficult of solution with regard to the kidney as it is in the case of the salivary and other glands. The theory of infection by the blood-stream has been very strongly advocated by Brewer and more recently by French, and the former has carried out an experimental investigation on the subject. The animals selected were chiefly rabbits, and the experiments consisted in the injection of cultures of different organisms after the injury of one kidney, either by bruising with the fingers through a wound, an external blow over the kidney, or by the injection of bismuth into the pelvis, or ligation of the ureter. He found, in five experiments, that no marked lesion occurred in either kidney. In the remaining eleven experiments, well-marked lesions developed in the injured organ, consisting chiefly of infarcts containing suppurating areas, which he regarded as being identical with those observed in his clinical cases. In eight experiments the lesions were unilateral. In the remaining three, they were bilateral, being much more advanced in the injured organ in two, while, in the third, the lesions were practically equal in extent and severity in both kidneys. No lesions occurred in control animals when moderate doses were injected. From these experiments, he concludes that injury of a single kidney, whether produced by trauma, by the presence of a foreign body in the pelvis, or by obstruction of the ureter, is a strong predisposing factor in the production of infection in the organ.

French strongly favours the hæmatogenous theory of infection in the pyelonephritis of pregnancy, and considers that constipation, which is so often associated with pregnancy, favours the passage of the bacillus coli from the alimentary canal into the blood-stream. The kidney has been shown to excrete organisms, and this factor, aided by the stagnation of

the urine above the obstructed ureter, he holds to explain the infection of the kidney. He points out that the normal valvular action of the ureteric orifice is not interfered with, the obstruction in the ureter being situated at the pelvic brim, and he also states that no evidence of cystitis is forthcoming, and that cystoscopic examination has shown the bladder to be perfectly healthy. He considers that these two facts are strongly against the theory of ascending infection.

The theory of an ascending infection has been put forward very strongly by Barnard in this country, and more recently by Dudgeon, Box, and Bond, and is supported by the following considerations. Attacks of renal inflammation very frequently follow the operation of transplantation of the ureters into the rectum, being often, indeed, the cause of a fatal termination in such cases, and it would appear to be obvious that, in these circumstances, infection takes place from below, and that the bacillus coli communis is the invading organism. The sex incidence, and, possibly, also the curious predilection for the right kidney, are more easily explained on this ground. Further, although French was unable to find any evidence of cystitis by a cystoscopic examination in his cases, instances undoubtedly do occur in which the clinical history points strongly to an initial inflammation of the bladder. Such a history was elicited by Barnard and by Bond in their cases, and also in Case I., described above. Again, as Bond points out, it is not necessary that the lower parts of a mucous tract should be affected by an ascending inflammation. He describes a case, which the writer had the privilege of seeing, in which pneumococcal peritonitis in a female child was apparently due to an ascending infection through the genital canal. Pneumococci were recovered from the vagina, uterine cavity, and Fallopian tubes, and microscopic examination of the tubes after death failed to show any signs of inflammation, although the organisms could be seen lying on and between the epithelial cells.

The possibility, or even the probability, of the occurrence of ascending infection in mucous canals was clearly established by the valuable experiments of Bond described in the "Address in Surgery" before the British Medical Association at Leicester, in

1905, by which he showed that solid particles could be carried up ducts in the reverse direction to the normal current. He further demonstrated that any interference, either continuous or intermittent, with the normal flow along such a canal, favoured the production of these ascending currents. Such an interference we have seen is present during pregnancy, and this will explain the onset of kidney infection, although the valvular action of the ureteric orifice is maintained. I have pointed out that a similar interference with the outflow of the urine may exist in some of the cases not associated with pregnancy, viz., under mobility or low position of the kidney leading to kinking of the ureter. The curious variations of the symptoms in Case II., in which the inflammation in each kidney subsided from time to time only to spring into activity again, seem to indicate that re-infection took place from below. In addition to these considerations, there are several facts which are antagonistic to the view that infection occurs by the blood-stream. In the majority of cases the lesion is unilateral, and in no instance has any other organ been affected. Again, the removal of the diseased kidney is followed by an immediate cessation of all symptoms of septic poisoning, and, in most cases, it is impossible to find a primary focus of infection.

The changes which take place in the kidney also support the idea that the infection comes from below, and not by the blood. Sundberg, in describing Lennander's specimen, pointed out that the wedge-shaped abscesses ended in the pyramids—were intra-lobular, while embolic wedges run down between the pyramids, and so are inter-lobular.

Microscopical examination in the writer's case showed that the chief changes took place around the straight tubules, when there was an abundant leucocyte exudation, and, in one of Brewer's cases, dilatation of the tubules was observed, and Brewer himself says that, in this case, the microscopical changes suggested an infection from below.

The numerous observations, carried out by Dudgeon on the urine in various conditions, showed that the bacillus coli may be present without giving rise to symptoms, and suggest that some accidental increase in the virulence of the organism may give

rise to an infective inflammation of the kidney.

From a study of the reported cases, it would seem that there is a distinct tendency to spontaneous cure; though the acute inflammation may be followed by a chronic condition of bacilluria, which may lead to subsequent attacks. Brewer regards the condition as so serious that immediate nephrectomy is advisable, being led to this conclusion by the high mortality which followed simple nephrotomy and drainage.

Similar views were held by Barnard, but there can be no doubt that many cases recover without surgical intervention, and a great many others after simple nephrotomy and drainage.

In one of French's cases the kidney was exposed and seen to be studded with small abscesses, and the patient recovered, although her general condition was such that nephrectomy was contra-indicated, and the wound was merely drained. French doubted whether the operation had any beneficial effect, but it is noteworthy that urine began to come away from the wound a fortnight after operation, and continued to do so for some weeks, so that there was some drainage of the kidney.

The administration of the various urinary antiseptics by the mouth has been found of no value by most observers. Some have tried to inhibit the growth of the bacilli by rendering the urine alkaline by means of large doses of potassium citrate, and have had good results. Both urinary antiseptics and potassium citrate were tried in the writer's case without producing any improvement.

Dudgeon advocates the administration of 25 c.c. of anti-colon bacillus serum daily for three days, combined with calcium lactate to avoid the occurrence of rashes, joint pains, and other undesirable sequelæ, and he states that he has treated 12 cases in this way with good results, the cure in five of the cases being rapid. With regard to vaccine treatment, he states that temporary improvement results, but is very apt to be followed by relapses.

Having regard to the tendency to spontaneous cure, and the variability in the extent of the lesion in the kidney, surgical intervention should be reserved for those cases that are losing ground under medical treatment. The most valuable remedy

seems to be anti-colon bacillus serum, which should be given in the doses indicated above. When no improvement follows, or the condition becomes more grave in spite of medical treatment, surgical intervention should be adopted, and this may take the form of primary nephrectomy, or nephrotomy and drainage, combined, in some cases, with excision of the diseased portion of the kidney. The advantages of nephrectomy are the rapid cure which follows, with healing of the wound by first intention, and the lower mortality which has so far been associated with this operation. On the other hand, although the convalescence after nephrotomy and drainage is prolonged, the patient is subsequently in a better position, having two kidneys instead of one, and, in consequence, the writer would reserve nephrectomy for those cases which are not relieved by the milder operation. When there is localised suppuration in the kidney, it may be advisable to excise the suppurating area, and drain the remnant of the kidney.

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INJECTION OF THE BROAD LIGAMENTS WITH
QUININE FOR PROLAPSUS UTERI.

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THE treatment of prolapsus uteri, to be successful, must be based on a proper knowledge of the structures which hold up this organ in health. For many years it was thought that the pelvic floor and the intra-abdominal pressure were the chief factors in supporting the uterus. Clinical observation and a slight knowledge of physics are sufficient to upset these views.

With regard to the pelvic floor, we constantly come across cases of ruptured perinæum, without any prolapsus, showing that something else besides the pelvic floor is holding up the uterus.

I recently operated on a patient at the Chelsea Hospital for Women with a complete tear of the perinæum extending into the rectum, that had existed for fifteen years without any prolapse following.

Again, in virgins, with an intact perinæum, the uterus comes down not infrequently, showing that the perinæum does not hold it up. Thirdly, a still further proof, if one is needed, is afforded by the results obtained from repair of the torn perinæum. However well this may be done, it fails to cure the prolapse in the majority of patients.

Does the intra-abdominal pressure help to hold up the uterus? If the abdominal cavity were a vacuum, something might be said for it, but even then the pressure of the atmosphere on the abdominal wall without any counter pressure from within would come to something like half a ton.

As a matter of fact there is no vacuum, because the abdominal cavity communicates with the external air through the Fallopian tubes. As the pressure of the atmosphere is equal in all directions, the pressure from this cause is the same above the uterus as it is below.

When, however, the abdominal muscles strongly contract, as in defæcation, an increase of direct pressure on the various organs in the pelvis takes place. So far from this helping to hold up the uterus, it has an exactly contrary effect. Just as it helps to empty the rectum by pressure, or force out the intestine and produce a hernia, so also does it force the uterus down, and tend to produce prolapse.

Having arrived, then, at the conclusion that there must be some other important factor in sustaining the uterus, I made a further study, fifteen years ago, of the anatomy of the uterine ligaments.

In a recent paper on the supports of the uterus, the credit of discerning that this organ is mainly held up by the connective tissues running from the side of the pelvis with the vessels to the side of the uterus, is given to a foreigner, whereas an Englishman was the first, by many years, to point out this fact. I may here remark that there seems to be a great tendency among one's contemporaries to quote foreign writers, and ignore the work of their own countrymen.

The late Dr. Henry Savage, in his book on the *Surgical Anatomy of the Female Pelvic Organs*, p. 69, stated "that after division of the utero-sacral ligaments, obstruction to prolapse is offered by the subperitoneal cellular tissue, particularly where it surrounds and accompanies the uterine blood vessels." On p. 26: "The utero iliac-cellular process accompanies the uterine vessels, forming a resisting fibro-cellular bond between the uterus and the sacro-iliac articulation."

Dr. Savage's book was published, in 1882, just thirteen years before a similar result was arrived at abroad.

Dr. Clarence Webster, in his book on *Researches in Female Pelvic Anatomy*, published in 1892, p. 87, stated that the chief ligament of the uterus was "the connective tissue attaching the cervix to the side walls of the pelvis, and also the muscular and elastic tissue in the same position."

Several other anatomists have described the utero-pelvic band, consisting of connective and elastic tissue with muscle strands running from the obturator fascia to the cervix.

That Dr. Savage's observations were correct seemed extremely probable, because they at once explained the

clinical facts observed in connection with prolapse, viz.: That the uterus would often keep up when the support of the pelvic floor is lost by rupture, and that the uterus sometimes comes down when the pelvic floor is intact, and giving all the support it is capable of. In the former case, the ligaments can hold up the uterus because they are strong, and, in the latter, the uterus comes down because they are weak.

An attempt was made to grapple with the condition by doing ventro-fixation. To this operation there are several objections. In order to understand them, it is necessary to have a clear conception of the difference between ventro-fixation and ventro-suspension. With the former operation a broad band of adhesion between the uterus and abdominal wall is formed. Before the menopause, if the adhesion is strong enough to hold up the prolapsed uterus, it is also strong enough to prevent its expansion should pregnancy occur. After the menopause, it is often difficult to obtain sufficient adhesion to prevent the uterus from separating again. If this end is achieved, the drag of the uterus will make a pouch of the abdominal wall when the latter is at all weak, much to the discomfort of the patient. These objections do not apply to ventro-suspension for retroflexion, by Kelly's method. Only two sutures are used, and the area of adhesion is quite small. This is enough to keep the uterus in position with simple retroflexion, while its mobility is not altogether abolished. Expansion during pregnancy can then take place, and it is quite the exception for any difficulty to arise.

If it is allowed that the uterus is chiefly kept up in health by the ligaments already described, the ideal treatment would be some method of strengthening these ligaments rather than creating a new one by attachment to the abdominal wall.

It occurred to me that this might be done by irritating the cellular tissue with quinine so as to produce an effusion of lymph that would form new connective tissue.

In all probability effusion would occur naturally, and repair follow, if the uterus were suddenly and violently dislocated, just as effusion and repair follow after sudden dislocation of an ordinary joint. But as the uterus comes down very slowly, there is never, at any time, sufficient stimulus to produce an effusion of lymph.

My friend, Dr. Aikman, told me that, when he had injected sulphate of quinine into the subcutaneous tissue of the arm for malaria, it produced effusion, and caused a small swelling that remained for some months. This seemed an ideal agent to use, because it is a strong antiseptic, and is non-poisonous.

The first patient was a woman, aged 61, with a procidentia of six years' duration. I explained to her that she would be the first to undergo a new operation, but that I had considered the question for some years in all its aspects, and did not think there could be much risk. Her answer was, that, as she had been to several hospitals and no one had cured her, she was ready to undergo any operation.

The solution first tried, in 1897, was 1-4. This produced a slight suppuration, the quantity injected was 30 drops on each side. As my object was to produce lymph and not pus, the solution was altered to 1-5, and to this I have adhered ever since.

This first patient did very well, and the uterus was held up. The discharge of pus amounted in all to about 2 drams.

My candid friends tried to dissuade me from going on, and predicted all sorts of dreadful catastrophes that would follow. One of the most common arguments used was that inflammation would be set up, which could not be controlled. As a matter of fact, the reaction set up by any irritant or injury is in proportion to the amount of that irritant, provided that no microbic infection occurs.

Shortly after the operation on the first patient, I treated a case of cancer of the cervix beyond excision with injections of methylene blue, which was then being advocated on the Continent. An intense reaction was produced in this patient with cancer and profuse suppuration, but in a few days it subsided. After this experiment with methylene blue, I felt fairly certain that my injections of quinine would do no harm, as I had no intention of setting up inflammation.

After injection there should not be any rise of temperature, nor does it often occur. Out of 150 cases I have only had 3 cases of suppuration, and they occurred in women exhausted by large families and in low condition. I am happy to say they were none the worse for it, and the uterus was well held up. The best time to operate is a week after menstruation

is over.

Before the operation is performed, the bowels are thoroughly cleared out, and the vagina well douched with 1-2000 perchloride of mercury. An anæsthetic is advisable, although the operation only takes a few minutes. The patient is placed in the lithotomy position. The next step is to pass the bladder sound, and ascertain to what extent it falls down on each side of the uterus. A Sims speculum is then passed to hold down the posterior vaginal wall, and a retractor to hold up the anterior vaginal wall. The retractor should be fairly wide so as to draw the bladder well up and out of the way. A straight sound is then passed into the uterus, and held horizontally by the left hand of the operator, while the syringe containing the solution is held in the right hand. The injection is then made on each side of the uterus through the vaginal wall at a distance of $\frac{3}{4}$ of an inch from the cervix, and a little below the level of the external os. The needle is one inch long. If the cervix is much enlarged, which often happens in prolapsus, the point of injection will be nearer to the cervix. The aim of the operator should be to insert the needle exactly half way between the position of normal cervix and the pelvic wall. Then the nearest portion of the uterine artery and veins and the ureter lie to the right of the needle and above it. Another point is that, in the outer half of the broad ligament in this situation, there are no veins of importance. Luschka's illustration of this is most misleading, and must have been arrived at by forcible dilatation of the veins on the cadaver. In doing other operations on the pelvis, I have constantly examined this cellular tissue, and found no vessels of importance in it.

When operating on cases of chronic procidentia, it is advisable to inject somewhat lower on account of the tendency of the bladder to pouch down on each side of the cervix. After the needle is in the cellular tissue, the point should be slightly rotated, so as to ascertain if it is free. Should the point have passed into any other structure, its movement would be restricted, as it would be held at two points.

The syringe must be efficient, and its joints water-tight, otherwise, the solution may simply ooze into the vagina. That which I use has a long thin straight nozzle, with the

needle fitted to the end; the object of this is to prevent the light being excluded from the vagina by the body of the syringe, and to enable the operator to see clearly the point of injection.

The needle is very apt to be corroded by the acid in the solution, and should therefore be tested before use, and thoroughly washed out after in warm water. After the injections are made, the operator proceeds to antevert the uterus as much as possible. A cup-and-stem india-rubber vaginal pessary is then inserted, and secured by tapes to a band round the waist.

It is very necessary to see that this pessary is well secured in position, so as to keep the uterus up for the first three days while the effusion is forming. After three days it may be taken out. If kept in longer it does no further good, and may do harm from pressure. There is no pain after the operation, as a rule; in fact, many patients say they would hardly know that they had been operated on. There should be no rise of temperature. This shows that there is no inflammation, and that the process is a reparative one. When a rise does occur, it is usually at the end of 6 to 7 days.

The patient is instructed to lie on her face or side as much as possible, so as to throw the uterus forward as much as possible, and keep it in good position. The bowels should be kept open every day. An accumulation in the rectum in near proximity to the effusion is not desirable. On the other hand, free purging must be avoided, as it would tend to restrain the formation of lymph. Occasionally, there is slight cystitis. This generally passes off in a few days, if it occurs at all. The catheter usually has to be passed for the first few days, or longer.

After injecting some 24 to 30 grains of quinine, one might expect some symptoms of cinchonism. This, however, is rare, and is explained no doubt by the precipitation of the quinine after injection. This precipitation very likely favours the formation of the fibrous strands, which can be felt in most patients at the end of two or three months.

The exact solution consists of 12 grains of the ordinary sulphate of quinine, dissolved in 30 m. of dilute sulphuric acid, and 30 m. of distilled water. It should be freshly made for each

patient, because, after a time, and more especially in cold weather, some deposit will take place. The stopper of the bottle is very liable to stick, the slight precipitation round acting like cement. The amount of solution injected will depend on the case. The worse the case the greater the amount required. The maximum that I have used has been 80 minims on each side, and the minimum effective doses for early cases of prolapse is about 40 minims.

As the space on the left side is encroached on by the rectum, I usually inject 10 minims less on that side than on the right. The quantity to inject will also depend on other factors, one of these being the general condition of the patient.

Speaking broadly, one may say that the healthy, florid, country woman will form more effusion than the pale, anæmic town dweller if the same dose is given to each ; the latter hence requires a larger injection.

The duration and extent of the prolapse must be taken into account. It stands to reason that a patient who has had complete procidentia for ten years will require more effusion to hold up the uterus than one who is only in the first stage, and can get about with the aid of a ring pessary.

For cases of chronic procidentia, such as one comes across in hospital practice, it may be necessary to do more than one injection. An interval of at least fourteen days should elapse before the second injection. The quantity injected should also be less by one-third, because the patients react more.

In one instance, the procidentia recurred when the pessary was taken out after the first and second injections, but a third injection held up the uterus. When a temperature does occur, it is nearly always after a second injection, so I try to avoid it if possible. The same principle applies to the amount of rest required after the operation so as to secure organisation of the effusion into fibrous tissue, and to prevent this from being stretched until it is strong enough to stand the strain.

For a case of prolapse in the first stage, a week to ten days in bed may be sufficient, followed by another ten days on the sofa. If a ring pessary is then inserted in order to take the weight of the uterus, the patient can go about the house and out for drives, but must still avoid anything that throws much strain on the uterus, such as lifting weights, etc. At the end

of three months, the ligaments are usually strong enough to do without the ring, but the full strength of the new fibrous tissue is not reached under six months.

This was strikingly illustrated in a farmer's wife sent to me, five years ago, by Dr. F. Bovill, for chronic procidentia. Although the uterus was held up, she was not able to do her full amount of work at the end of four months, but, at the end of six months, she could work ten hours a day, on her feet most of the time, and she has remained quite well ever since.

If the perinæum is ruptured, it should also be repaired.

Although I do not believe that the pelvic floor in any way keeps up the uterus, it stops prolapse of the vaginal walls, and prevents them from dragging on the uterus, bladder, and rectum.

Repair of the perinæum, therefore, adds much to the comfort of the patient, and also helps the ligaments.

For minor cases of prolapse, the two operations can be done at one sitting. The ligaments are first injected, and then a perinæorrhaphy is done. As the use of a pessary, under these conditions, is impossible, the patient's hips are kept raised a little, while she is in bed for the first three days, so as to cause gravitation of the uterus to a high position in the pelvis.

I do not advise the two operations together on cases of procidentia, because vomiting after the anæsthetic might force the uterus right out, unless kept in place by a pessary. It might then be fixed too low down, or the pressure on the perinæum might prevent union of the wound.

The best means to adopt so as to secure organisation of the effusion into fibrous tissue is somewhat of a problem.

Neither physiologists nor pathologists have ever thrown any light on this subject. Why, after parametritis from a microbic infection, the effusion should in one case apparently entirely absorb, and, in another, should form stout adhesions, we are quite in the dark.

Empirical knowledge in respect to this question helps us a great deal.

After dislocation of any joint in the body, there can be no doubt whatever that organisation of the effusion into fibrous tissue takes place more extensively and rapidly if

that joint is kept absolutely at rest. If kept at rest too long, the repair may be overdone, and the normal movements of the joint are interfered with. The explanation of this latter phenomenon is to be found in the study of evolution. The primitive man had to get about soon after an accident or he starved, consequently Nature effused enough lymph to repair the damage in spite of the early use of the joint. Those that did not effuse sufficient were wiped out, so that we inherit a tendency to overrepair our joints after an injury.

The application of this lesson to the treatment of prolapse indicates that, after injection, the patient should be kept at rest. The greater the amount of fibrous tissue required to keep up the uterus the longer should the patient lay up.

When we wish to cause absorption of adhesions or effusion round a joint we use massage, which increases the circulation locally through the part.

In the pelvis, therefore, after the effusion is formed, we must avoid anything likely to cause an increase in the local circulation.

The results are on the whole very good :—

Taking all the easiest cases and also the most difficult, the latter forming by far the larger proportion, and including a great many cases of chronic procidentia, I find that in 75 per cent. the uterus has kept up permanently, 20 per cent. were greatly improved, and 5 per cent. failed.

Taking only those cases of comparatively early prolapse, such as one usually meets in private practice, the percentage of successes is as high as 98. Other doctors, who have followed me, are able to claim a higher percentage of success than I can, which shows that I am not biassed in favour of my own work. If every patient in the early stage were operated on, we should not see so many cases of chronic procidentia. In time this condition might almost be abolished.

My first case was in 1897, so that I have had eleven years' experience. Up to now I have done over 150 cases, and, in addition, I may quote 80 cases done by other medical men as follows :—

Dr. Rice, of Derby, has operated on 31 patients. All but one of these were successful. Three of the patients had children after the operation, without any return of the prolapse. One patient was aged seventy-two.

Dr. Eugene Carlier, of Brussels, operated on 15 cases, and wrote to say he was very satisfied with the results.

Dr. S. Kent, of Bexhill, operated on 9 patients, all successful. Two of these had children without recurrence of the procidentia.

Dr. Lea Wilson operated on 8 patients at the Dhankorbai Hospital, Nasik, India. All of these succeeded, but she had not been able to follow them up to know the remote results, except in one case, which was quite well after a year, and was seven months pregnant.

Dr. John Aikman, of Guernsey, has operated on 7 patients. In every case the uterus was held up, and had remained so for some years, although procidentia had preceded the operation in most of the patients.

Dr. Crewdon Thomas published a case in the *British Medical Journal* of a successful result followed by conception and parturition, with no return of the prolapse.

Dr. Hugh Fenton has done 7 cases, mostly successful.

Dr. Eden operated on a case in which ventro-fixation completely failed, but was able to hold up the uterus by injection.

One great advantage of this operation is that it does not in any way interfere with pregnancy. Taking all the patients under thirty-five years of age, nearly 40 per cent. of them have had children, and also without any difficulty. In conclusion, I may say:—

That the operation is fairly simple, and takes only a few minutes to perform.

It appears to be free from risk, if carried out properly.

It causes no pain afterwards.

It is more effective for its purpose than any other treatment.



FIVE CASES OF RESECTION OF LARGE LENGTHS OF SMALL INTESTINE FOR GANGRENE.

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A BRIEF account of the cases will first be given, attention being subsequently drawn to the points of interest.

Case 1. Resection of 2 feet 1 inch.—Mrs. P., æt. 52, stout, and the subject of chronic bronchitis. Irreducible umbilical hernia five years; advised against operation for radical cure at the Samaritan Hospital in 1900, and recommended to wear an abdominal belt. On September 7, 1903, at 7 a.m., while lifting a bucket of water, felt a sudden severe pain in the abdomen, and was immediately sick. From that time to September 9, the date of operation, she was constantly sick, and passed neither flatus nor fæces. The lump at the umbilicus became inflamed and tender, and the skin over it œdematous. Seen in consultation with Dr. Fowler of Portsmouth at midnight on September 9. *Immediate operation*, 65 hours after onset of attack. In the sac of the hernia, besides omentum, 3 inches of quite gangrenous small intestine was found. The infection and inflammation of the intestine in its neighbourhood were so advanced that, in order to secure the anastomosis in healthy intestine, 2 feet 1 inch required excision. End-to-end anastomosis was performed, the sac was excised, inflamed skin removed, and the abdomen was closed without drainage. The patient's recovery was without incident, the wound healing by first intention, with the exception that there were one or two small skin sloughs, and the highest temperature recorded after operation was 100°.

Case 2. Resection of 9 feet 6 inches.—This case will be very briefly alluded to, as a full report of it has already appeared in the *B.M.J.*, in the record of the Surgical Section of the British Medical Association meeting held at Exeter in 1907, where the specimen was exhibited. The patient was a female, aged 59. The gangrenous intestine was contained partly within the sac of a large old femoral hernia, and partly within the abdomen, and from its anatomical distribution was almost certainly due to embolism of the superior mesenteric artery just below the origin of the right colic. The length of intestine actually gangrenous was 8 feet 1 inch. On the proximal side of this, 12½ inches were considered unsafe for the anastomosis, and on the distal side 4½ inches, making the total length excised 9 feet 6 inches, which, I believe, is the largest recorded amount removed in this country. Both ends of the divided intestine were closed, and a lateral anastomosis was performed between the small intestine and cæcum, the distal end of the excision being just about the ileo-cæcal valve. The operation was performed outside the abdomen by pulling the intestine down through the very large mouth of an old hernial sac. The peritoneal cavity was closed without drainage, a small gauze wick was inserted beneath the

superficial wound. The patient made a very good recovery, and for several weeks appeared to be maintaining her nutrition fairly well. She then began to suffer from constant diarrhœa, and loss of weight and strength, and eventually died of marasmus seven months after operation. The patient was sent to the Royal Portsmouth Hospital by Dr. H. Case of Fareham.

Case 3. Resection of 1 foot $5\frac{1}{2}$ inches.—H. P., female, æt. 65, was sent to me at the Portsmouth Hospital by Dr. Gaston. On May 14th, 1907, she was retching during a bilious attack, to which she was subject, when she felt a sudden severe pain in the right groin and lower abdomen. Pain and vomiting continued for 3 days. Admitted to hospital on May 17th. A red œdematous lump was present in the right groin. *Immediate operation 3 days after strangulation.* On opening the sac, foul-smelling pus escaped, and $5\frac{1}{2}$ inches of small intestine were found to be gangrenous. On the proximal side of this, 8 inches and, on the distal, 4 inches were removed, before meeting healthy bowel. Both divided ends were closed, and a lateral anastomosis was performed. On account of the great septicity present, I did not like to close the neck of the sac, and a small gauze drain was passed just within it. Recovery was uneventful, the temperature remaining normal after the operation.

Case 4. Resection of 3 feet 1 inch.—P. A., female, æt. 64, the subject of an old large umbilical hernia, was sent to the Portsmouth Hospital under my care on May 1st, 1908, by Dr. Sheahan. On July 29th, she was taken ill with sudden acute abdominal pain, vomiting, and absence of passage of flatus and fæces. A large tender tumour present at the umbilicus, with the skin over it red and œdematous. On admission, fæcal vomiting present, and great collapse. *Immediate operation 3 days after the onset of the attack.*—1 foot 8 inches of gangrenous small intestine was present in the sac. On the proximal side of this, 9 inches, and, on the distal side, 6 inches were excised to enable the anastomosis to be performed in healthy-looking intestine, making a total excision of 3 feet 1 inch. The ends were closed, and lateral anastomosis was performed. The sac was excised, and the abdomen closed without drainage. The patient did not rally from the shock, and died in 24 hours.

Case 5. Resection of 1 foot 11 inches.—G. A., female, æt. 65, sent to me at the Portsmouth Hospital by Dr. Carling of Southsea, the subject of a large femoral hernia for 20 years. For 3 days previous to admission, she had not been able to get the rupture back, and had passed no flatus or fæces. Twenty-four hours before admission, she felt a sudden severe pain in the groin and lower abdomen, and since then had had constant eructation and retching, but no actual vomiting. Admitted August 26th, 1908. Tumour tender and tense; temperature $96\cdot8^{\circ}$; pulse good. *Immediate operation 24 hours or possibly 3 days after strangulation.* On opening the sac, 10 inches of gangrenous small intestine were found within it. On the proximal side of this, an additional 8 inches, and, on the distal side, an additional 6 inches were removed before encountering healthy intestine for the anastomosis, making a total resection of 1 foot 11 inches. The ends of the bowel were closed, and a lateral anastomosis was performed. The sac was removed, the peritoneal cavity closed, and a small gauze wick left in the superficial wound. Normal recovery. Highest temperature after operation, $99\cdot6^{\circ}$. Wound healed by first

intention except in the track of the wick. The following table shows, at a glance, the important features of these cases:—

TABLE.

—	Sex.	Age.	Form of Hernia.	Interval between onset of symptoms and operation.	Length of Intestine Gangrenous.	Length of Intestine Resected.	Form of Anas-tomosis.	Result.
i.	F.	52	Umbilical	65 hours	3 inches	2 ft. 1 in.	End to end	Recovery.
ii.	F.	59	Femoral	14 hours	8 ft. 1 in.	9 ft. 6 in.	Lateral	Recovery.*
iii.	F.	65	Femoral	3 days	5½ inches	1 ft. 5½ in.	Lateral	Recovery.
iv.	F.	64	Umbilical	3 days	1 ft. 8 in.	3 ft. 1 in.	Lateral	Death in 24 hours.
v.	F.	65	Femoral	24 hours (perhaps 3 days).	10 inches	1 ft. 11 in.	Lateral	Recovery.

* Died seven months afterwards of marasmus.

REMARKS.

1. *Immediate Results.*—The immediate results (80 per cent. of recoveries) in these cases must be considered satisfactory, especially if the ages of the patients are taken into account. Not one of them was under 50 years; the oldest was 65, and the average age was 61. Age, however, as we know, is no bar to successful major operation. The risk of infection is probably no greater in the old than in the young, and, if this is eliminated, most of the dangers of post-operative illness, which naturally taxes the powers of endurance of the former to a greater degree than of the latter, are eliminated with it. With regard to shock, this depends more on the number of minutes of the operation than on the number of years of the patient, Except Case 4, who was in a state of collapse at the time of the operation, from which she never rallied, none of the patients gave rise to any anxiety from shock, and none of them had practically any infection of their wounds. Their recoveries were perfectly smooth, the highest post-operative temperature recorded being 100°. The dangers, to which the subjects of hernia are liable, as exemplified in these cases, and the case with

which even such severe operations as those recorded here are borne, constitute strong arguments in favour of performing radical cure in old people and in large hernia, with the subsequent wearing of an adequate support.

2. *Remote Results*.—The only case requiring comment is No. 2. This demonstrates that, in a patient 59 years of age, the removal of half the small intestine is unsafe. Of course, in the circumstances, the risk had to be taken, and the immediate recovery was all that could be desired. After some weeks, however, a steadily progressing marasmus set in, to which, notwithstanding attention to diet and medical treatment, the patient succumbed in 7 months.

Numerous experiments on animals have been made with the object of determining how great a length of intestine may be excised without serious disturbance of the metabolism. As the result of these, Senn is of opinion that it is not safe to remove more than one-third, while Trzebicky and Monari believe that half may be removed without serious damage. No amount of experiment alone will settle the matter, and obviously no hard-and-fast rule can be formulated. First of all, the intestine has been found to vary considerably in length in different individuals, and, as Moynihan¹ points out, it is not the length removed, but the length left that matters. Again, the age of the patient would be very likely to influence the ultimate result. In some of the experiments, where recovery has followed removal of large lengths of bowel, the intestine left behind has been found hypertrophied, and its mucous membrane more richly covered with villi. The powers of regeneration and compensation are greater in the young than in the old, and, *ceteris paribus*, young people might be expected to make up for the loss of large lengths of the intestinal tract more easily than those advancing in life. In a boy, aged 10 years, 8 feet 4½ inches have been removed without obvious interference with the metabolism. Lastly, the personal equation of the patient, of which we know absolutely nothing, may influence the result in many ways. The case here recorded at all events proves that, in a patient aged 59, the removal of half the small intestine (reckoning its average length at about 20 feet—Quain) is unsafe, and liable to be followed by uncontrollable diarrhoea

¹ Moynihan: *Abdominal Operations*.

and marasmus, eventuating in death.

3. *Sex*.—It is noteworthy that all of the patients were women, and occurred in herniæ which are almost peculiar to the female sex. The liability of the intestine to become tightly nipped in small femoral herniæ is well known, but, with the exception of Case 3, all of these cases were large ruptures, with wide mouths, Cases 2 and 5 being unusually so for herniæ in the femoral region.

4. *Onset*.—In four out of the five cases, the onset was very definite, being marked by very sudden acute pain as the first symptom. In Cases 1 and 3, exertion was clearly the cause. In Case 5, the onset was not so well marked, and the attack might have come on gradually, 3 days, or suddenly, 24 hours, previous to the operation.

5. *The Disproportion between the Amount actually Gangrenous and the Amount excised*.—It is a well recognised principle of the surgery of these cases that the actual length excised (within limits) is of no consequence, the essential condition of success being that the anastomosis should take place in healthy intestine, and many cases of failure have been recorded, due to leakage at the line of anastomosis, or to perforation in its neighbourhood. The infected, inflamed, œdematous, and distended condition of the intestine, extending from the area of gangrene, was conspicuous in all of these cases (more so on the proximal than the distal side, as is invariably the case), and the principle of giving this a wide berth was carried out remorselessly. Thus, in Case 1, though only 3 inches were actually gangrenous, 2 feet had to be excised before healthy intestine was encountered; in Case 2, 8 feet 1 inch were gangrenous, 9 feet 6 inches were excised; in Case 3, only $5\frac{1}{2}$ inches were gangrenous, yet 1 foot $5\frac{1}{2}$ inches required resection; in Case 4, 1 foot 8 inches were gangrenous, 3 feet 1 inch required resection; in Case 5, 10 inches only were gangrenous, yet 2 feet required excision. The long interval that elapsed, in four out of the five cases, between the deprivation of the blood supply to the part and the operation (3 days), accounted for the extensive infection of the neighbouring intestine and the wide resection required. Whatever the length requiring resection, the rule of performing the anastomosis in healthy intestine is absolute. The only exception to this is

where very large lengths, as in Case 2, require excision, and the surgeon is anxious as to whether what remains will be sufficient to maintain life and health. In such a case, he would, of course, go as near the gangrenous gut as he dared. In all other cases, too much rather than too little should be the rule.

6. *Form of Anastomosis*.—In Case 1, an end-to-end union of the divided intestine was made, and this answered well. In Cases 2, 3, 4, and 5, both ends of the divided intestine were closed, and a subsequent lateral anastomosis was performed. It is my conviction that this is the best form of intestinal anastomosis, and should be done in preference to an end-to-end junction whenever practicable. It is especially indicated in the cases treated of here. In the first place, the calibre of the intestine, above and below the excised portion, is always distinctly different. Again, however healthy the intestine may appear, it is under suspicion, and the circulation through it may not be of the best. That anastomosis, which leaves no weak spot, should therefore be chosen. Lateral anastomosis affords a sense of security which the circular method lacks. I have, in an experience of a very large number of intestinal anastomoses, never had a leakage from a lateral junction, whether between stomach and intestine, or between intestine and intestine. In my opinion, it should be the standard form of intestinal union, the circular method being reserved for those cases in which the other is impracticable. The length of time occupied by the two methods is about the same.

7. *Healing of the Wound*.—The smooth healing of the wound in all of these cases is worthy of remark. The peritoneal cavity was closed in all of them save No. 3, where, owing to the very foul condition of the contents of the sac, I passed a small gauze wick within its neck after returning the intestine into the abdomen. I feel sure, however, that this precaution could have been dispensed with. To trust the peritoneum, and credit it with ability to take care of itself, are being more and more recognised in abdominal surgery every day. Again, in these cases, there was no elaborate preparation beforehand of the operation area. All of them were emergencies, operated upon immediately after admission, and prepared on the table just before operation. In some of them, inflamed and infected

skin was cut away. Yet all healed practically by first intention, the highest post-operative temperature recorded being 100° . I have long ago, in all of my operations, abandoned the double preparation of the skin advocated by many surgeons, substituting for it a single preparation upon the day of operation, and I believe the latter to be quite as efficient a technique, while doing away with some manifest disadvantages of the former, such, for instance, as entailing the patient passing the night, previous to an operation, enveloped in a wet compress, directing an anxious attention to his crisis, and thereby very likely ensuring for him a sleepless night.



THE PRESENT STATE OF OUR KNOWLEDGE OF PEMPHIGUS.

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ONE of the most difficult and confusing of the groups of skin diseases at the present time is that, in which the leading characteristic is the presence of blebs or bullæ, namely, the group of the "bullous eruptions." The term pemphigus was at one time used indiscriminately for almost all cutaneous affections in which bullæ occurred, except those in which the bullæ resulted from traumatism. As our knowledge of the ætiology and pathogenesis of skin diseases advanced, it was found that, under the heading of pemphigus, a number of bullous eruptions had been included, which were distinct entities, differing from one another in their clinical picture, course, and causation, and, in consequence, one after another of these bullous affections has been removed from the pemphigus group so that, at the present time, the name pemphigus has come to be applied in a comparatively restricted sense. In this contribution, I will endeavour to state the present position with regard to the pemphigus group, and will refer especially to the problems of ætiology and pathogenesis, as it is upon them that a clearer understanding of this subject depends. In order to clear the way, it will be of service to refer briefly to a few of the conditions once included under the heading of Pemphigus.

Bullous Eruptions formerly included in the Pemphigus group.—*Pemphigus congenitalis* is a rare bullous affection, which may be present at birth, but generally becomes apparent some-time later during the first month. It is characterised by the presence of bullæ, which develop, as a result of slight injuries to the skin, such as scratching, rubbing, rough handling, pressure, etc. It is a congenital anomaly of the skin, in which a peculiar vulnerability exists with unusual instability of the vaso-motor control of the cutaneous blood vessels, so that the

slightest traumatism is succeeded by the formation of a blister. It is sometimes known as "traumatic pemphigus," but more commonly as "Epidermolysis bullosa hereditaria."

Pemphigus contagiosus is a bullous affection of a purely local nature, being spread by contact. It is due to the inoculation, through an abrasion of the skin, of a streptococcus, and is simply a bullous form of impetigo. Sir Patrick Manson has described a similar affection in the tropics, under the heading of "*Pemphigus contagiosus tropicus*."

Pemphigus gravidarum is a bullous eruption, which occasionally occurs in pregnant women, especially about the puerperium. It is one of the varieties of the disease described by Dühring as "*Dermatitis herpetiformis*" (*vide* page 380).

Pemphigus hystericus is a name which has been applied to a rare type of case, in which a bullous eruption is present in association with a functional disturbance of the nervous system and hysterical symptoms. Though a few of those cases may be *bonâ fide*, in a considerable number of them the bullæ are artificially produced by the painting on of some blistering fluid for the purpose of malingering.

Pemphigus leprosus is a cutaneous manifestation of leprosy, in which bullæ occur in the skin secondary to the involvement by the lepra-bacilli of the nerves, supplying the area affected.

Pemphigus neonatorum is a bullous eruption of new-born infants, which usually makes its appearance a few days after birth. It is now a comparatively rare disease in this country, thanks to improved hygiene, and the employment of aseptic methods at the puerperium. It used to occur, however, in a severe epidemic form in lying-in institutions, or in the practice of a particular midwife, and was associated with a high rate of mortality. One of the last epidemics to be fully described, occurred at the Richmond Lying-in Charity in the autumn of 1902, and was reported by Dr. G. T. Maguire¹ to the Obstetrical Society of London. In this epidemic, 18 cases occurred, of these, 12 were in the charge of one midwife, and 8 were fatal, dying with symptoms of acute toxæmia. There would appear to be two grades of *Pemphigus neonatorum*, (*a*) a benign type, in which the affection is mild and only involves the skin, and (*b*) a malignant type, in which

the infection is more virulent, and affects not only the skin, but has gained entrance into the general circulation, probably in the majority of cases through the unhealed umbilical stump. This probability was borne out in the Richmond epidemic, as Maguire observed that, in all the fatal cases, the lower part of the abdomen was severely affected, and the umbilical stump was swollen and inflamed.

This affection is now generally believed to be of pyogenic origin, and to be a form of impetigo of the new-born, and due to the same microbe as the phlyctenular impetigo of older children and adults. The source of infection may be the midwife, mother, or even the medical attendant, and, in not a few of the cases, it has been traced to a definite pyogenic focus, such as a whitlow on the hand of the nurse. Its close relation to impetigo contagiosa has been shown by the fact that instances have occurred, in which an infant suffering from pemphigus neonatorum has infected an older child with impetigo contagiosa, the initial lesion of which is a small vesicle. A case exemplifying this came under my care at the Victoria Hospital for Children, in November 1908. An infant, aged 12 days, was brought to the hospital with a bullous eruption of the type of pemphigus neonatorum, involving the face, neck, and limbs, the palm and soles not being affected. The earliest lesion was a bleb on the neck, which had appeared a few days previously. Soon after the eruption developed, a young brother, aged 2 years, who had been kissing the infant, became affected with impetigo contagiosa of the face, and the mother, who was nursing the infant, became affected with impetigo on one breast.

It seems most probable that the streptococcus, which is known to be the cause of impetigo contagiosa, is also responsible for pemphigus neonatorum. Various observers have isolated this microbe from the lesion, and in a case which came under my observation, in 1903, a pure culture of it was obtained from a bleb. Other micro-organisms, such as staphylococci, which have been obtained from the blebs, are probably secondary contaminations, or result from the technique employed in making the culture being imperfect.

These facts give a definite indication for the treatment of such cases, namely, the immediate employment of the most

thorough antiseptic methods, such as baths of weak potassium permanganate or boric acid, antiseptic dressings, and the protection of the umbilicus to prevent, at all costs, a general infection taking place, and, where it is too late, and general symptoms have supervened, the stimulation of the patient, and the use of antistreptococcic serum.

Pemphigus syphiliticus is a bullous syphilide, which affects chiefly the palms and soles of hereditary syphilitic infants. The condition is almost invariably associated with other stigmata of hereditary syphilis, such as wasting, the peculiar earthy hue of the skin, copper-tinted macules and papules, frontal bosses, and fissures at the angles of the mouth. In the contents of the bullæ, the spirochæta pallida has recently been demonstrated by Levaditi.

The elimination of these definite types of cases, in several of which the ætiology is now fully understood, limits the term pemphigus to the series of cases, of which chronic pemphigus is the prototype. But before referring to pemphigus, and its varieties, it will be an advantage to review, in a general manner, certain anatomical and pathological considerations connected with the formation of bullæ, which throw some light on the vexed problem of the ætiology of pemphigus.*

Anatomical and Pathological Considerations in the Formation of Bullæ.—The microscopical picture presented by bullæ, while varying in detail according to the stage of the bullous formation, has certain histological characteristics which are common to bullæ however caused. These are (*a*) marked dilatation of the blood-vessels and lymphatic spaces of the underlying corium, (*b*) serous exudation, and (*c*) peri-vascular cellular infiltration. The serous exudation may be greatest either immediately beneath the epidermis in the position of the papillary layer, in which case the roof of the bleb will be formed by the whole thickness of the epidermis, or the main part of the exudate may be collected in the epidermis

* In addition to the definite entities described above, a number of other types of pemphigus have been described, such as *Pemphigus diphtheriticus*, *P. diutinus*, *P. benignus*, *P. febrilis*, *P. gangrænosus*, *P. malignus*, etc. These names simply emphasise the most important clinical peculiarity of different cases of ordinary pemphigus, in the customary dog-latin, handed down from mediæval medical literature.

itself, which has been split up to form the bullous cavity, the splitting generally taking place immediately above the granular layer, so that the roof of the bleb consists of the Stratum corneum. It was at one time thought that the exact position of the bleb in the skin remained more or less constant for each bullous affection, and, in consequence, the site of the bullæ in the skin, was suggested as a basis of classification of bullous diseases. This was found to be untrustworthy, as it was discovered that not only was the precise position of the bullæ in the skin inconstant in different patients suffering from the same disease, but even in different regions in the skin in the same patient. The factors, determining the position of the bullæ, were found to be, (1) the region of the body affected, for where they occurred in situations like the palms and soles, where the epidermis was tough, they tended to be sub-epidermal, while, about the face and flexor aspects of the limbs where the epidermis was weaker, they were generally intra-epidermal, and (2) the power of resistance of the skin of the individual affected, which, if weak by nature or disease, permitted the exudate to separate the epidermal cells to readily form an intra-epidermal bulla.

It has been asserted by various writers that some pathological weakening of resistance and diminished power of cohesion must precede the bullous formation. But this factor, though playing an important part in such conditions as "Epidermolysis bullosa hereditaria," may be wholly negligible, and the sole consideration is the more or less rapid exudation of serum, so increasing the pressure in the lymphatic spaces between the fibres and cells of the skin that it separates them apart, and collects to form a bulla in the situation of least resistance. This rapid serous exudation may be the direct result of various causes, and, in order to understand how these can operate, it is necessary to briefly consider the structure and arrangement of the cutaneous blood vessels. The blood vessels of the corium belong to the category of capillaries, being fine tubes, whose walls are simply composed of an endothelial layer, and have no muscular layer, they are thus easily dilated by internal pressure and readily rupture. The blood vessels in the subcutaneous tissue, and in the deepest

portion of the corium, on the other hand, belong to the category of small arteries and veins, have a muscular coat, and are controlled by a vaso-motor nervous mechanism. In order that a marked increase in the pressure of the cutaneous capillaries should take place, accompanied by dilatation and exudation of serum, it is necessary that more blood should flow into the skin by an inhibition of the vaso-constrictor tone of the underlying small arteries, without a compensatory dilation of the corresponding veins to enable it to be carried as rapidly away, or that, apart from any increased flow from the arteries, a blockage should be present in the small veins, which increases the pressure in the capillaries. Changes of this nature may be the result of different causes. One of the most potent of them is the presence of toxins in the lymph of the skin, which cause a spastic contraction of the veins in passing through them, and, at the same time, have a destructive action on the endothelium of the capillaries, facilitating an exudation of serum when the pressure in the capillaries rises.

These toxins may be of microbic origin, as in the case of *Impetigo contagiosa* and *Pemphigus neonatorum*, where the toxin is produced by streptococci, and is possibly combined with a poisonous secretion from the epidermal cells secreted to counteract it; or they may be organic in nature as in the case of snake poison. There is another factor in this connection, which is even more important than the spastic contraction of the veins, and that is the sero-taxis, or attraction of the serum from the capillaries by the toxin in the inter-epithelial lymphatics or in the lymph spaces in the corium.

Toxins of various kinds circulating in the blood, on reaching the small arteries underlying the skin, cause a dilatation by inhibiting the vaso-constrictor mechanism, without affecting the small veins to a like extent, and so the pressure in the capillaries may be raised, and exudation of serum take place. Various inorganic poisons, such as iodide of potassium, may occasionally do this, but, in the majority of instances, the irritant is an organic poison either produced by a microbe, or absorbed into the blood from the alimentary tract, or resulting from imperfect elimination by the kidneys, or impaired action of the liver.

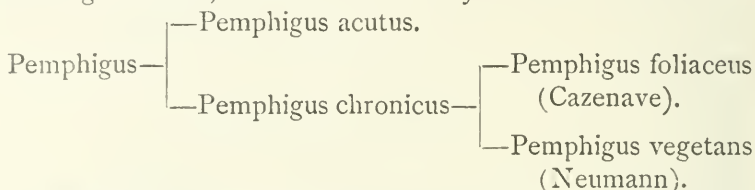
In short, it may be said that the majority of bullous

eruptions result from the presence of toxins in the skin, which may have reached there from without, and be of microbic or chemical origin, or may have come *viâ* the blood-stream, in which case they are usually of an endogenous nature.

So far no reference has been made to the part played by the nervous system in the production of bullæ. The reason for this is that, although certain nervous derangements may directly determine the formation of bullæ, it would seem that the influence of the nervous system in the ætiology of bullous eruptions has been considerably exaggerated. A number of different clinical and pathological observations have contributed in emphasising the influence of the nervous system in this connection. For example, bullæ have been known to follow injury to peripheral nerves, and diseased states of the nerve, as in the bullæ of leprosy; they have also been known to occur in association with various diseases of the cord and brain, such as hemiplegia and meningitis, and in association with functional trouble. Organic changes have been reported by eminent authorities, as occurring in the peripheral nerves, sympathetic ganglia, spinal cord, and cerebral cortex, in cases of pemphigus. It is possible, however, that these changes, which are of a degenerative type, and are not by any means constantly found, might be toxic in origin, and, instead of being responsible for the bullæ, might be produced by the same cause. There is no gainsaying the fact, however, that injury and disease of a nerve may result in the formation of a bleb in the area supplied by that nerve. It has been suggested that this is partially due to an interference with the action of certain trophic nerves, supposed to be present in the skin. This may or may not be the case, but the chief factor in the production of the bullæ, when the nerve is deranged, is probably the interference with the vaso-motor control of the small arteries. In the case of the angio-neurotic group of disease, of which urticaria is the prototype, instances occur in which the wheal is replaced by a bullæ (urticaria bullosa), and, in such cases, it is believed that the toxin, which is responsible for the lesion, acts by causing a functional disturbance of the vaso-motor mechanism of the skin. It has been asserted also, in this connection, by Török and others, that the disturbance in the skin corre-

sponds histologically with the early stages of an acute inflammation.

Varieties of Pemphigus.—The name pemphigus, as already stated, is now restricted to a small and somewhat rare group of bullous diseases. For convenience of description, it is customary to provisionally divide up pemphigus into the following varieties, which I will briefly consider seriatim :—



Pemphigus acutus is a name, which is at present applied to a type of acute bullous eruption, associated with severe constitutional symptoms of a septicæmic type, and usually fatal. These cases have almost invariably occurred in adults, and, in almost all the cases, the patients have been butchers, or, those whose business it was to handle animal products such as hides. In these cases, the eruption of bullæ is more or less widely disseminated, affecting the mucous membranes as well as the skin. In 1896, Pernet and Bulloch² reported such a case in detail, and collected a number of others from the literature ; since then, other cases have been recorded, one of the most recent being that by Bowen,³ in 1904. In the case described by Pernet, a butcher had a gathering on the finger, which resulted from a small wound received in the course of his occupation. Round this lesion, several months later, a bulla formed, which was opened and healed in a week. Next day bullæ began to appear elsewhere, varying in size from a pea to a hen's egg. Gradually the bullous eruptions spread, till they became widely disseminated over the skin, scalp, and buccal mucosa. A fortnight later severe septicæmic symptoms supervened, and the patient was admitted to the University College Hospital, under the care of Dr. Radcliffe-Crocker, where he died two days later. In nearly all the reported cases, there has been a definite history of injury, such as a scratch received while cutting up a carcase, a poisoned thumb in a tanner, a sore following a dog-bite, etc. After a varying incubation period, which may be several months, a bullous eruption has

made its appearance, more or less suddenly, but frequently preceded by prodromal symptoms such as shivering, malaise, etc. The bullæ may form on apparently healthy skin, or be preceded by erythematous patches. In association with the eruption, constitutional symptoms of a septicæmic type occur, corresponding in severity with the extent of the eruption, and leading generally to a fatal issue.

The cause of this affection is believed to be a specific microbe of animal origin, which has gained entrance at the abrasion, where it may cause a bleb to form. When it has multiplied sufficiently, and become widely distributed throughout the system, it causes the septicæmic symptoms, and its presence in the skin, either reaching there locally from auto-inoculation, or being carried there, *viâ* the blood-stream, causes the eruption of bullæ.

Several micro-organisms have been suggested as the cause of acute pemphigus, but the one, which at present has most evidence in its favour, is that isolated by Bulloch from Pernet's case, namely, a diplococcus, which was pathogenic to a guinea-pig, and was recognised as being identical with the diplococcus described by Demme in a similar case.

Pemphigus chronicus may be regarded as the classical member of the group, and, when the name pemphigus is employed without qualifying adjective, it should be taken to mean chronic pemphigus. In this affection, the blebs commence as vesicles, and increase in size up to a hen's egg. They usually develop on apparently normal skin, and come out irregularly, or in crops, but have no tendency to be grouped. Their appearance may be associated with no febrile disturbance; on the other hand, each crop may be preceded by a slight rise in temperature, and the patient may appear to be definitely ill. As a rule, the eruption is not accompanied by subjective symptoms, such as burning, or itching, and, where marked subjective symptoms are present, the cases usually belong to the category of Dermatitis Herpetiformis (*vide infra*). Each bleb lasts 3 to 10 days. The crops keep coming out for weeks or months, then gradually stop. The contents of the bullæ is at first clear serum, but this soon becomes cloudy from the presence of pyogenic microbes in it, and an inflammatory halo develops around the bleb. In severe cases, the contents of

the blebs may be hæmorrhagic, or gangrænous lesions may intervene. The mucous membranes, chiefly those of the mouth, fauces, stomach, and nose, may be affected. In a case under my care at the present time in a boy, owing to the occurrence of blebs about the fauces, and probably lower down, he has had great difficulty in swallowing his food, and has frequently vomited immediately after taking it.

Under the heading of Dermatitis Herpetiformis, Duhring has grouped a number of cases, which were at one time included under the wing of pemphigus, namely, cases in which the vesico-bullous eruption is associated with marked subjective symptoms, such as pricking and itching. So close is the relation between pemphigus and dermatitis herpetiformis that certain authorities, such as Kaposi, believed that they were the same disease. This is not generally admitted at the present time, and cases of chronic pemphigus are distinguished from those of dermatitis herpetiformis by the following characteristics. In dermatitis herpetiformis, the lesions are multiform in type, and may be erythematous papules, pustules, vesicles, and bullæ, while those of pemphigus are simply vesicles or bullæ; in *derm. herp.*, the lesions are grouped like those of herpes, hence the name, while in pemphigus they are arranged irregularly. *Derm. herp.* occurs in separate attacks, pemphigus is more or less continuous from fresh crops of bullæ coming out; in *derm. herp.* the eruption is associated with pricking, itching, and burning, subjective symptoms frequently out of all proportion, in severity, to the extent of the rash, in pemphigus, as a rule, subjective symptoms are absent; in *derm. herp.*, lesions do not occur on the mucosa, in pemphigus, they are frequently present there; in *derm. herp.*, the general health is usually good, while in pemphigus, it is generally impaired.

The cause of chronic pemphigus is still *sub judice*. The course of the disease, the general symptoms and bad health, which may be associated with the eruption, and the febrile disturbance, which may precede the appearance of a crop of bullæ, all suggest that it is due to toxin. But the nature of this toxin is as yet unknown.

It has frequently been suggested that the toxin is of microbic origin. Various micro-organisms have been found in the bullæ, one of the most frequent being a streptococcus. Dr. J. L. Bunch,⁴ for example, has recorded a case in which

streptococci were found in the blebs, and the opsonic index was low to streptococci. Consequently, injections of streptococci were given, and an improvement took place. The streptococcus found was recognised as being similar to the *S. salivarius*. Isolated observations of this sort are of great importance, but they must be corroborated in a considerable number of instances before it can be said that a specific microbe has been established. Against it there is the fact that, in a large number of records, the contents of the bullæ have been found to be sterile. In the case, at present under my care, at the Victoria Hospital for Children, and referred to above, the contents of the bullæ were found to be sterile on two successive occasions, and the opsonic index to streptococcus, kindly taken by Mr. Ledingham of the Lister Institute, was found to be .8. On the other hand, the toxin may be endogenous, and either produced in excess in the alimentary tract, or imperfectly eliminated. The decision of this problem must be left to future experiment and observation. The possible relation of the nervous system to the disease, and the view that it is due to toxins acting on the nerve centres, have been already referred to, and further reference to it will not be made here.

Pemphigus foliaceus is a form of dermatitis, which tends to become universal, in which an abortive bullous condition is succeeded by exfoliation of the epidermis. It is generally believed to be a variety of chronic pemphigus, and cases are recorded in which chronic pemphigus has become pemphigus foliaceus. In this affection, the bullæ, instead of reaching maturity, abort, and become replaced by patches of exfoliating epidermis, or persist as flaccid blebs, which, on breaking, leave shiny moist patches, partially denuded of epidermis, or covered with crusts. These denuded surfaces are not infrequently dotted over with pinhead-sized shiny papules, which are small epidermic cysts. The mucous membranes may be affected, and, in severe cases, the nails and hairs may be shed. The general health is not, as a rule, affected at first, but it soon becomes impaired, the internal organs, more especially the kidneys, becoming involved, and the patient may gradually sink and die in a state of profound collapse. On the other hand, recovery may take place, but remissions are apt to occur.

The cause of this affection is unknown. Owing to the fact

that an excess of eosinophile leucocytes has been found in the contents of the flabby blebs, as well as in the blood of patients affected, it was suggested by Leredde that it was a toxic affection, chiefly involving the blood-forming organs, such as the bone-marrow; and that some poisonous substance was present in the blood, which, on reaching the skin, caused the eruption. On the other hand, a microbic origin has been put forward as the probable cause, and it has been compared with an exfoliative type of dermatitis occurring in infants, described by Ritter as "*Dermatitis exfoliativa neonatorum*," which is believed to be due to micro-organisms; and has been known to follow a whitlow with multiple lymphangitis.

Pemphigus vegetans, which may be provisionally regarded as a variety of pemphigus chronicus, has of late attracted considerable attention, because several cases have been published recently, and, in one of these, marked changes were discovered in the central and peripheral nervous system. In this type of pemphigus, the bullæ in certain situations, such as the axillæ, about the genitalia, and sides of the mouth, on breaking, are succeeded by vegetating growths which spring up from the base, and coalesce to form offensive fungating masses. The disease may commence like an ordinary pemphigus, as in a case described by Wilfrid Fox,⁵ but it soon develops serious characteristics, as it tends to spread serpigiously, and even to ulcerate; while in the special situations, where the skin is moist, the papillomatous lesions appear.

The affection frequently commences about the mouth, but the first lesion may appear elsewhere, as on the vagina, or umbilicus. The skin eruption is associated with severe constitutional symptoms, and a fatal issue is to be expected. Occasionally, a somewhat benign type is met with, in which apparent remissions take place, and death is delayed for years.

Pemphigus vegetans is generally believed to be a systemic toxic infection of bacterial origin, the fungating masses being regarded as an epi-phenomenon, probably due to the secondary inoculation of the lesions with staphylococci. The latter hypothesis is borne out by the fact that the vegetations tend to disappear with the use of antiseptics. A number of microbes have been found in the bullæ and the blood of these cases, such as pseudo-diphtheritic bacilli pathogenic to guinea-pigs

(Waelsch), streptococci (MacCormac),⁶ *B. pyocyaneus* (Winfield, Pernet). On the other hand, the blebs have been repeatedly found to be sterile, and negative results, so far as streptococci are concerned, are reported by Jamieson and Welsh in their recently published case. In several of the recorded cases, a preliminary septic focus has been present, such as a sore mouth (Köbner), a septic finger (Haslund), and an anal abscess (Ferand). In Jamieson and Welsh's⁷ case, degenerative changes were found in the spinal cord, cerebral cortex and sympathetic ganglia, which suggested to the authors the action of a bacterial toxin.

From this brief review of the varieties of pemphigus, it will be evident that the clinical features of the different members of the pemphigus group are now well defined, but that the ætiology of the majority of them remains uncertain. The bias of opinion is in favour of a toxin causation, either of microbic origin, or of an endogenous nature apart from microbes. Whether these toxins act directly on the skin, and so produce the bullæ, or whether the bullæ result indirectly from the action of the toxins on nerve centres, is a point which is at present under discussion, but since it is known that bullæ can directly result from poisons on the skin, it does not seem necessary to invoke the aid of the nervous system in their production.

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RETROSPECT OF OTOTOLOGY.

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IN the departments of *Anatomy and Physiology* no great strides have been made the last twelve months. Guthrie (*J. of L.*, xxiii., 541) has called attention to the origin of the processus gracilis of the malleus as a separate membrane bone which joins the malleus, and not as a part of Meckel's cartilage. He also pointed out the manner in which the cavity of the tympanum is developed. Schaefer and Sessous (*J. of L.*, xxiii., 409) have investigated the importance of the middle ear apparatus for hearing, especially of the lowest tones, and find that, when the tympanic membrane and ossicles are wanting, the duration of hearing for single tones is the more shortened the lower the tone. Sohler Bryant (*A. of O.*, xxxvii.) has attacked Helmholtz's theory, without, however, greatly injuring it. Lord Rayleigh (*N. Q.*, i. 3) discussed the way in which direction of sound is perceived.

Our *methods of clinical examination* have been enriched by several interesting papers. Wyatt Wingrave's (*J. of L.*, xxiii., 302) thoughtful account of the clinical pathology of aural discharges is one of these, whilst the results, obtained by Darling (*E. M. J.*), from cytological examination of middle ear discharges, coincided with those of Milligan in 1907. Royce (*C. J. M. S.*) has also discussed the more important germs found in aural discharges.

As regards the investigation of hearing, Bárány (*J. of L.*, xxiii., 363) has devised a "noise apparatus," for the detection of unilateral deafness. Hegener (*J. of L.*, xxiii., 428) considers that the upper tone limit has been placed too high, and is not really more than 20,000 double vibrations. He objects to Galton's whistle as a test, and prefers Schulze's monochord or Seebeck's tubes. The important work of Bárány in the investigation of the condition of the labyrinth has been followed by Tweedie (*J. of L.*, xxiii., 582) in deaf-mutes, whilst for those whose knowledge of German is too limited to read

Bárány's original paper, Pike's (*J. of L.*, xxiii., 596) valuable paper will be most useful.

The *External Ear* does not occupy a large field for investigation. Of new growths (excluding malignant disease) Yearsley (*B.J.C.D.*, v., 121) has described a case of angioma of the auricle and meatus, and Pasquier (*J. of L.*, xxiii., 567) one of Botryomycosis. Furniss Potter (*J. of L.*, xxiii., 332) showed a remarkable instance of hyperplasia of the auricle from eczema, and Kelson (*J. of L.*, xxiii., 111) an interesting stenosis of the meatus. Fagge (*J. of L.*, xxiii., 198) excised a branchial sinus leading from the neck into the meatus, and Heath (*L.I.*, 1841) described a dermoid cyst over the mastoid. Of foreign bodies, Yearsley (*J. of L.*, xxiii., 103) met with a remarkable instance, in which a grass seed was removed from the tympanic membrane in which it was embedded, and through which it was growing by a fine rootlet. Gifford (*B.U.N.C.M.*, ii., 33) describes some cases of unusual foreign bodies, including one in the tympanum.

The *Middle Ear* has, as usual, come in for a large share of the literature. The additions may be divided into the following heads:—(1) *Injuries*. Cheatle (*J. of L.*, xxiii., 107) described nine specimens of fracture through the temporal bone, and Yoshii and Siebenmann (*J. of L.*, xxiii., 433) demonstrated the effects of experimental injury. Piffi (*A. f. O.*, Bd. 72, Heft 1 and 2, 77) narrated an interesting case of foreign body in the Eustachian tube. (2) Of the *Acute Otites*, Bowen (*W.L.M.J.*, April) published a thoughtful paper on pneumococcic otitis media based upon over 100 cases. He found the pneumococcus to be the pathogenic organism in all cases of acute middle ear suppuration, the path of infection being usually *viâ* the Eustachian tube. Neumann (*D.M.Z.*, No. 31) considers that middle ear disease in children nearly always arises by way of the tube, and is rarely hæmatogenous. Caboche (*A.M.O.*, May) divided acute suppurations in children into two categories, and pleaded for early antrotomy. The only other contributions of note to acute otitis media are those of Furet (*J. of L.*, xxiii., 50) of five cases of mastoiditis in diabetics, of which only one was cured by operation, and of Luc (*J. of L.*, xxiii., 51) of a case of acute mastoiditis in a diabetic, complicated with paralysis of the sixth nerve, and

a deep cervical abscess. (3) Several important papers in connection with *chronic suppuration* are to be noted, among them being two on the conservative treatment of that disease by Körner (*J. of L.*, xxiii., 426) and Scheibe (*J. of L.*, xxiii., 427). The former advocates regular cleansing with peroxide of hydrogen, the use of nitrate of silver and alcohol, and the removal of diseased or useless ossicles. Scheibe does not agree with the removal of ossicles. An interesting case of purulent middle ear inflammation was recorded by Bronner (*J. of L.*, xxiii., 197) as occurring during secondary syphilis. One very important paper was that of Barr (*J. of L.*, xxiii., 553) on paralysis of the sixth nerve consequent upon chronic suppuration, with reports of two cases. Barr has also (*J. of L.*, xxiii., 492) described a method of grafting, under local anæsthesia, in the after treatment of the radical mastoid operation. In regard to this operation Leland (*B.M.S.J.*, April) suggested the obliteration of the mastoid exenterated cavity by means of a periosteal flap, and McCullagh (*N.Y.M.J.*, 1145) pleaded for a more extended trial of the modified blood-clot method in mastoid surgery. Syme (*J. of L.*, xxiii., 327) described an interesting case of Bezold's mastoiditis discharging into the pharynx, and Kretschmann recorded a case of partial fistula occurring after a mastoid operation. Under the title of "An Unusual Sequel to the Radical Mastoid Operation," Porter (*J. of L.*, xxiii., 491) described the case of a boy of 16, with attic suppuration, in which no modified operation would have been justifiable, in whom there was an unusual and rapid new formation of bone, and in whom the excellent hearing result was due to the presence of an intact stapes. (4) Among the *complications of suppuration*, Alt (*J. of L.*, xxiii., 438) discussed the operative treatment of otogenic facial paralysis, especially as regards facio-hypoglossal anastomosis. An important discussion (*B.M.J.*, II. 1265) was opened by Ballance at the Annual Meeting of the British Medical Association, in which the intracranial complications of suppurative otitis media were exhaustively dealt with. Spira (*J. of L.*, xxiii., 14) recorded in full a case of extra-dural abscess, induced by middle ear disease, and Jakins (*J. of L.*, xxiii., 34) published an instance in which meningitis, subsequent to mastoiditis

in a tuberculous patient, was relieved and apparently cured by lumbar puncture. Claque (*A.M.O.*, February) described a fatal case of suppurative meningitis of otitic origin, and Yearsley (*B.ſ.C.D.*, v., 121) showed a specimen in which suppurative meningitis was due to an erosion of the superior semicircular canal. Interesting cerebral abscess cases have been described by Turner and Wade (*ſ. of L.*, xxiii., 286), one of which was complicated with sinus thrombosis on the opposite side. A useful paper by Trotter (*B.M.ſ.*, i., 612) discusses the symptoms of cerebellar abscess, and Paterson (*ſ. of L.*, xxiii., 197) recorded a case of this complication, in which there was crossed abducens paralysis. Lateral sinus implication has also been found by McBride (*ſ. of L.*, xxiii., 483) in a case of cerebellar abscess, and Turner (*Ibid.*, 485), Syme (*Ibid.*, 325) and Permewan (*Ibid.*, 487) have described instances of sinus infection. Cornet (*Ibid.*, 568) reported thrombo-phlebitis of the lateral sinus in a child, aged 4, in which the vessel was opened and drained, and recovery occurred after protracted septicæmia. Otitic cavernous sinus thrombosis has been described by Stucky (*Ibid.*, 529) and Hanna (*Ibid.*, 364).

(5) The literature of *non-suppurative middle-ear disease* is never so prolific as that of the suppurative conditions. During 1908, Bryant (*ſ. of L.*, xxiii., 133) and Yearsley (*P.*, lxxx., 115), have published papers on middle-ear deafness, both of which are cheerful in tone. Emerson (*B.M.S.ſ.*, April), has drawn attention to the rôle of Rosenmüller's fossæ in relation to the middle ear, and his paper repays perusal. Bryant (*ſ. of L.*, xxiii., 164) has reported two cases of chronic catarrhal otitis media, showing improved hearing after the operative treatment of acute mastoiditis.

(6) The only contributions to the literature of *Otosclerosis* have been one by Politzer (*ſ. of L.*, xxiii., 432), on the anatomical condition of the foot-plate of the stapes in otosclerosis, in which he conclusively proves that, in typical clinical cases, we have to do with a primary disease of the labyrinthine capsule, and a useful paper by Hammerschlag (*A.I.L.O.*, xxv., 397), in which the whole literature is well reviewed.

The increasing interest in diseases of the *Internal Ea*

has been well shown during 1908 by numerous published papers and cases of interest and value. As in the case of the middle ear, it is necessary to deal with these papers under different headings. In interest and importance the *surgery of the labyrinth* must come first. Cases of labyrinthine suppuration have been described by Scott (*J. of L.*, xxii., 102), and Yearsley (*Ibid.*, 191, 131). The former extirpated the whole labyrinth in a girl, of 20, who had suffered from otorrhœa from infancy, with excellent result. The latter found an erosion into the external semicircular canal, with absence of the stapes and caries of the fenestra ovalis in an acquired deaf-mute boy, aged 8, and laid open the vestibule with the same result. In his second case there was complete labyrinth necrosis in a woman, aged 22. This case also recovered. Vestibulotomy was also performed in a boy of 11 by Fraser (*J. of L.*, xxiii., 495). The whole question of labyrinthine suppuration was dealt with in an important paper read before the Otological Section of the Royal Society of Medicine by Scott and West, and published *in extenso* in the *Transactions of the Society* (Vol. i., pt. 6).

Labyrinthine surgery in cases of vertigo and tinnitus, not due to suppurative disease, has resulted in the publication of at least three important cases. Gibson and Lake (*J. of L.*, xxiii., 496) gave full notes of a case first shown before the Otological Society of Great Britain in 1905, in which both vestibules were ablated for the relief of vertigo. This patient retains good co-ordination and equilibrium. Yearsley (*L.*, ii., 871) destroyed the vestibule and cochlea for severe tinnitus and vertigo in a man, aged 48, with complete success, both symptoms ceasing after the operation, and not having returned since. The more formidable operation of section of the auditory nerve for painful tinnitus has been performed by Ballance (*L.*, ii., 1070).

As regards *syphilitic internal ear deafness*, Wanner (*J. of L.*, xxiii., 430) has discussed the functional examination in cases of inherited syphilis, and Glover (*A.M.O.*, February) has reported a case of bilateral central deafness in a man showing the stigmata of inherited syphilis, whose son, aged 13, became also deaf, suffered from interstitial keratitis and choroido-retinitis, and had Hutchinson teeth. Such cases of syphilis inherited in

the second generation are extremely rare. Lake (*J. of L.*, xxiii., 105) published full notes of a man, aged 27, in whom syphilitic internal ear deafness appeared whilst he was under active specific treatment, and suggested that the condition might be due to toxic effects. A resumé of our knowledge of the aural manifestations of inherited syphilis was published by Yearsley (*B.J.C.D.*, v., 195).

A case of *Menière's symptoms*, due to inflammation of the nasal accessory cavities, was described by Burger (*P.O.L.B.*, February). Grant (*J. of L.*, xxiii., 329) reported an interesting instance of unilateral *hysterical deafness*, and Lawrence (*Ibid.*, 110), a case in which a deaf-mute, probably hysterical, regained hearing. Cunningham (*Ibid.*, 193) has published cases of deafness following *epidemic cerebro-spinal meningitis*.

Malignant growths of the ear are best taken together, irrespective of locality. Tod (*J. of L.*, xxiii., 112) reported two cases of epithelioma, one of the auricle and one of the tympanic cavity, the latter with secondary affection of the skin over the mastoid, and Milligan (*Ibid.*, 199), a case of epithelioma of the middle ear following injury. Nager (*Ibid.*, 435) demonstrated the formation of labyrinth sequestra in cases of middle-ear carcinoma. One interesting case of *sarcoma* of the mastoid, which followed an operation for mastoiditis, was reported by King (*N.O.M.S.J.*, 186).

The *medico-legal* aspect of otology was represented by Milligan's case of traumatic epithelioma mentioned above, and by an instance of injury to the Eustachian tube by unskilful nasal operation, narrated by Syme (*J. of L.*, xviii., 328). Related to legal medicine is the question of school medical inspection, which is likely to occupy close attention from otologists in the near future. The question of the hearing in relation to this subject was discussed by Yearsley (*B.J.C.D.*, v., 497).

Lastly, it remains to mention the new works on otology which have appeared during 1908. Gray has published the second volume of his beautiful work on *The Labyrinth of Animals*; Kyle, a second edition of his *Manual of Diseases of the Ear, Nose, and Throat*; and Politzer, a fifth edition of the *Lehrbuch der Ohrenheilkunde*, whilst of new books, Moure has issued his *Guide Pratique des Maladies de la Gorge, du Larynx, des Oreilles, et du Nez (Cavités Recessoires Comprises)*;

Ballenger his *Diseases of the Nose, Throat, and Ear, Medical and Surgical*, and Yearsley, *A Text Book of Diseases of the Ear*,

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For convenience of reference, the following abbreviations have been adopted and placed in brackets, the number of the volume being given in Roman numerals, the page in figures :—

- A. f. O.* : Archives für Ohrenheilkunde.
A.I.L.O.R. : Archives Internationales de Laryngologie, d'Otologie, et de Rhinologie.
A. of O. : Archives of Otology.
A.M.O. : Annales des Maladies de l'Oreille, etc.
B.J.C.D. : British Journal of Children's Diseases.
B.M.J. : British Medical Journal.
B.M.S.J. : Boston Medical and Surgical Journal.
B.UN.C.M. : Bulletin of the University of Nebraska College of Medicine.
C.J.M.S. : Canadian Journal of the Medical Sciences.
D.M.Z. : Deutsche medicinische Zeitschrift.
E.M.J. : Edinburgh Medical Journal.
J. of L. : Journal of Laryngology.
L. : Lancet.
N.O.M.S.J. : New Orleans Medical and Surgical Journal.
N.Q. : New Quarterly.
N.Y.M.J. : New York Medical Journal.
P. : THE PRACTITIONER.
P.O.L.B. : La Presse Oto-laryngol Belge.
W.L.M.J. : West London Medical Journal.



APPENDICITIS IN GENERAL PRACTICE.

BY G. MCKERROW, M.B., C.M., AND J. S. GEIKIE, M.B., CH.B.

THIS paper has not been undertaken with the idea of adding anything to the sum of our knowledge of appendicitis, but in the hope that it may induce others to consider the matter, not from the point of view of the specialist, but from that of the general practitioner. There is no disease, more sudden in its onset, more rapid in its progress, more deceptive in its appearances; there is none that makes greater demand on the vigilance and presence of mind of the practitioner. For the surgeon in a large hospital, with hundreds of patients passing under his hands, the interest in the individual must of necessity be submerged in the interest of the case. A successful operation for a perforated appendix with peritonitis is only a fresh addition to his record. To the general practitioner it is of greater interest. Probably his patient is also his friend, he enters into his family life, he meets him going to his business, and the personal element figures largely in the relationship between the two. So it comes about that the lessons, learnt from a few cases, may be stamped as vividly on the mind as the conclusions drawn from a few hundred such in hospital.

A considerable number of cases of appendicitis have occurred in our practice, and we have kept records of the most interesting of these, during the last two and a half years; they number 34, and are embodied in this paper. Previous to this, such cases were much less frequent, and, on looking back at the work of the last six years, we are forced to the conclusion that, in this neighbourhood, at any rate, the disease is on the increase.

Predisposing Causes.—Perhaps what first strikes one is that the majority of our cases have occurred in very healthy individuals. Indeed, as a rule, the attack of appendicitis was the first serious ailment from which they had ever suffered. Moreover, with one exception, all led steady and regular lives. Of the 34 cases mentioned above, 20 occurred in women, and 14 in men; most of the patients were young, but the ages varied

from $2\frac{1}{2}$ to 50. In three cases we found that either a brother or a sister had suffered from attacks of appendicitis; one case, that of a boy, 12 years old, was the direct result of a blow on the right flank; three other patients had just completed fairly long railway journeys; one had partaken of a lobster and champagne lunch on the previous day; one girl, of 13, had suffered some months previously from mucous colitis, and two proved tubercular. As regards the question of climatic influence, in our experience, the disease has occurred more frequently in summer than in winter.

We shall say nothing concerning the various organisms which cause the mischief, because, unfortunately from the clinical point of view, these cannot be discovered by means of external examination. One point, however, is worth mentioning: should pus be found at the operation, whether localised in an abscess, or free in the peritoneal cavity, some should be collected, and a vaccine made ready. In both these types, one has to be prepared for a long and serious illness, and, in our experience, the use of a vaccine has certainly hastened the healing of the wound. Moreover, it takes time to prepare a vaccine, and, should the patient take a sudden turn for the worse, there may not be time to procure it before it is urgently required.

Symptoms.—In the first place, we would lay it down, as a rule, that every case with abdominal symptoms, to which no definite cause can be assigned, should be regarded as suspicious, and carefully watched. It is often impossible, on seeing a patient for the first time, to say whether appendicitis is present; but within 12 hours, or less, the characteristic features may have declared themselves, and our experience (possibly an unfortunate one) goes to prove that it is just the case, presenting a few vague abdominal symptoms, that may suddenly, and without warning, show signs of perforation.

As a rule, the patient complains of pain, which may be localised over McBurney's point, or somewhere in the near neighbourhood. It may be most severe in the pit of the stomach, or high up on the right side of the abdomen, or, again, it may be general over the abdomen; it may come in spasms, or it may appear as a constant aching in the

region of the appendix. A combination of the two last types is most common, but, frequently, the patient seems unable to locate the pain, and is rather inclined to complain of general discomfort. By palpation, it is often possible to fix the seat of maximum tenderness over the appendix; but it may be found elsewhere, *e.g.*, over the pit of the stomach, or over the right kidney. Flatulence may be present, which sometimes renders an accurate examination difficult. The patient may or may not complain of sickness, and there is often actual vomiting. The tongue is dirty, and there is often a history of constipation, though there may be diarrhœa. Pain may be felt on micturition or defæcation. Often a patient will say that he would feel perfectly well if only his bowels would move. In the case of a woman, it is well to be certain that she is not menstruating, as any tenderness about the abdomen will be increased if this is the case. Fever may be absent at the commencement of an attack, and develop later, or the case may run an apyrexial course. The pulse rate is generally increased, but, again, during the whole course of the illness, it may not rise above 100°. In one of the severest cases we had, as regards pain, the temperature never rose above 99°, nor the pulse above 100. The patient was an officer in the army, and had to be kept under morphia for four days. A large swelling developed in the right iliac region, but gradually subsided, and he made a good recovery without operation. In only one of our other cases was such intense pain present. The patient, a girl of 22, was first seen on a Saturday evening at 7 p.m. She had gone to bed in the afternoon, feeling ill, and had spasms of great pain over the appendix, with a continuous dull ache in the intervals. There was well-marked localised tenderness, and an exceedingly tender swelling could be felt per rectum. Pulse, 108; temperature, 102°. She was operated upon on Sunday forenoon; her appendix was gangrænous throughout, contained a concretion, and was on the point of rupturing. She made an uninterrupted recovery.

Diagnosis.—It must be remembered that the general practitioner is often called upon to diagnose a case before the typical symptoms have had time to develop, and it is at this early period of the illness that it is often impossible

to give an opinion. The symptoms may be due to gastrointestinal disturbance, arising from a chill, or from indiscretion in diet, as in the case of Mr. B., who, after an afternoon's golf, dined heartily, partaking, amongst other things, of apple tart. He was seized with severe pain in the night, and felt convinced that he was suffering from appendicitis. He was seen next morning at 7, and there was a great deal of tenderness over the abdomen, slightly more marked, if anything, over the appendix. Nothing could be discovered by rectal examination, his tongue was dirty, and his breath offensive. Pulse 82, temperature normal. He was ordered sips of hot water, with small doses of saline every three hours. By evening he was feeling better, and the attack gradually passed off within three days.

On the other hand, such a series of symptoms may be the precursors of an attack of appendicitis in its acutest form, and the practitioner may suddenly find himself confronted with a perforation. Here is a case in point :—

Mr. P. was first seen on a Sunday afternoon, and complained of some abdominal discomfort and pain. Pulse, 74 ; temperature, normal. He said that, on the previous Thursday, feeling some pain in the abdomen, he had, with considerable benefit, taken a dose of medicine with the idea that his stomach was out of order. On the Saturday he had lunched with friends, partaking freely of champagne and lobster, an indulgence in which he rarely allowed himself. He had a certain amount of flatulent distension, and slight tenderness over the lower portion of the abdomen. His tongue was dirty, and his bowels had not moved that day. The man did not look ill, and, had it not been for the history of a severe attack of appendicitis nine years previously, we should have ascribed his symptoms to the results of champagne and lobsters. It may be mentioned, by the way, that operation had been urged after the first attack, but had never been performed, possibly because the surgeon, whom he consulted at the time, told him that, if there were no recurrence within six months, he might consider himself safe. The termination of the case, however, goes to prove the truth of the axiom, that no patient, who retains an appendix, which has once troubled him, can ever consider himself safe. With this history before us, we ordered

him to bed, and restricted his diet to sips of hot water. Next morning there was little change in the general condition, but the patient had suffered severely from griping pain in the night. Pulse, 80; temperature, normal. There was no local tenderness, or rigidity of the abdominal wall, and rectal examination gave no results. The hot water was continued, and the friends were instructed to telephone at once if he became worse. Unfortunately, his wife took it upon herself to administer a large dose of castor oil, and, when the patient was seen at 6.30 p.m., there was no doubt about the diagnosis. His bowels had moved, and he declared that he felt better, but his pulse was 120; temperature, 102° ; and there was acute tenderness over McBurney's point. Had immediate operation been performed, as we wished, the patient would, in all likelihood, have recovered, but, unfortunately, owing to the attitude of the friends, surgical interference was delayed till the next day, when a gangrænous, perforated appendix, with localised, suppurative peritonitis, was found, and the patient died within the week of general peritonitis.

Now these two cases certainly presented peculiar difficulties in diagnosis, as, in the case of Mr. P., even rectal examination proved of no assistance, and we have had similar cases, in which it gave no results in the early stages; in others, however, tenderness could be felt per rectum, when external pressure over the abdomen revealed nothing. In general practice, one often hesitates before making a rectal examination from a desire to spare the patient's feelings, especially if the only complaint is of vague abdominal discomfort; but such important information may be elicited, in this way, that we think it should be employed in every case of which we are in the least suspicious.

Amongst our recorded cases are five of peculiar interest as regards diagnosis:—

(1) Miss D., aged 10, suffered from repeated attacks of colicky pain in the region of the cæcum, with well-marked local tenderness. These were associated with a dirty tongue, offensive breath, constipation, fever, and general malaise. Operation was decided upon after one of her attacks. The condition proved not to be appendicitis, but there were two tubercular glands at the base of the cæcum. As in many

tubercular cases, the exploration cured the condition. This was the first hint of tubercular trouble in this patient, but since then she has developed tubercular glands on both sides of the neck, which have required excision.

(2) and (3). These cases were complicated by tubal mischief. In one, an appendicitic abscess was discovered, involving the Fallopian tube. In the other, the patient had what seemed a typical attack of appendicitis, and, in the course of a few days, developed a large lump in the region of the appendix. She was a very neurotic woman, and refused to allow a rectal or vaginal examination, save under chloroform. A surgeon was called in, prepared to operate. When she was anæsthetized, the swelling in the region of the appendix appeared to be continuous with a swelling to be felt in the right vaginal fornix. The surgeon decided not to operate, as he considered the condition one of parametritis. The patient recovered, and the tumour gradually disappeared, but we are still inclined to think that the case was appendicitic rather than parametric.

(4) Miss W., aged 18, was treated for some months for symptoms of gastric catarrh. There were no definite signs, such as hæmorrhage, actually pointing to gastric ulcer. She complained, however, of marked pain in the epigastrium, which increased, as a rule, after food. Pressure in that region also showed marked tenderness. She suffered from chronic constipation, had a dirty tongue, and was also anæmic. At first we suspected the commencement of a gastric ulcer, and, under treatment for that, she improved for a time, but only to relapse. Over and over again, we examined her, but could find nothing more definite. We were then inclined to revise our diagnosis, and, as the girl was neurotic, we suspected a hysterical element. She was tried on a solid diet, and again improved, but in a few weeks another relapse occurred. Ultimately, after about six months of more or less ill health, we found well marked pain over the appendix for the first time during one of her attacks. The girl had lost greatly in weight, and we were very anxious about her. A surgeon was consulted, and agreed that chronic appendicitis might have given rise to the symptoms. She was operated upon, and the condition of the appendix, greatly

thickened and inflamed, proved the diagnosis to be correct. There was some trouble after the operation, as the bowels would not move, so, on the tenth day, the wound was opened, but nothing could be found. She ultimately made an excellent recovery, and has never complained of gastric symptoms since. The stoppage of the bowels was probably hysterical, and this element also entered into the previous gastric history ; yet, at the back of it all, serious mischief had been going on.

(5) Mr. T., aged 27, who had recently returned from Africa, repeatedly suffered from slight gastro-intestinal attacks. Sometimes he had pain in the epigastrium, sometimes it was more generalised over the abdomen, but pain was not a very prominent symptom. He had chronic constipation, which was always accentuated during these attacks. They were accompanied by fever, an accelerated pulse, a dirty tongue, an offensive breath, and a general feeling of malaise. He had been a victim of malaria in Africa, and was inclined to attribute his recurrent illnesses to an increased susceptibility to chills, engendered by his old enemy. However, in one of his attacks, pressure over the appendix revealed tenderness, which could be felt later in another attack. He was advised to have his appendix removed. This was done, and it was found to be thickened and bent on itself. He made an uninterrupted recovery, and has enjoyed good health ever since.

If we were asked to classify the various types of appendicitis, we should place them in two classes : (1) where the symptoms are so mild that one wonders afterwards whether the patient really has had appendicitis ; (2) where there is no doubt from the first as to the nature of the illness, one's only wonder being what will happen to the appendix. Now it may be possible for a man, with a very large experience of appendicitis, to definitely say whether a case will recover without operation, and he may be right in 90 per cent. of cases ; yet, if he is in general practice, and the 10 per cent. of failures occur in anything like a sequence, his reputation will be badly damaged. Our experience has been that the surgeons, whom we have called in in consultation, have been no better able than ourselves to predict the condition of affairs inside the abdomen. In the case of the girl, with the gangrænous appendix, mentioned above, who was operated upon within 16 hours,

the surgeon agreed that it was acute appendicitis, but said that of course she might recover without operation. He quite agreed with immediate operation, but was certainly surprised at the condition in which he found the appendix. Now, while the condition of the appendix is a matter of conjecture before operation, we will go further, and say that it is sometimes impossible to diagnose perforation for some hours after its occurrence. Indeed the practitioner in charge has a better opportunity of making this diagnosis, especially if he is seeing the patient several times a day, than the surgeon who has to draw his conclusions from one examination. Here is a case in point.

Miss O., aged 24, fell ill on a Sunday night, and was seen first on Monday forenoon. She had had some diarrhoea, with colicky pain during the night; she had also vomited, and complained of pain in the stomach. There was tenderness on pressure in the epigastrium, and some slight general tenderness over the lower part of the abdomen. She was put on sips of hot water, and very small doses of saline every four hours. At night, she was a little better. Next day she was no worse, no definite symptoms of appendicitis could be found from the commencement of the illness, there had been no rise in temperature or pulse rate. At 2.30 a.m. on Wednesday, she was suddenly seized with such severe pain over the appendix that she almost fainted. This was followed by a rigor, and the temperature rose to 105° , and the pulse to 116. At 10.30 a.m., a surgeon saw her. The temperature had fallen to 101° , pulse to 108. There was acute tenderness over the appendix, and rigidity of the right rectus, but the rest of the abdomen could be palpated without pain. She was quite bright and felt fairly comfortable. An operation was decided upon; we ourselves were certain that perforation had taken place, whilst the surgeon was almost inclined to doubt it. On opening the abdomen over the appendix, pus and fluid welled out. Another incision was made in the middle line. Pus was found as high up as the liver, and another incision was made on the right flank. The appendix was removed. The temperature fell to normal, and unfortunately never rose again. The poison was so severe that the patient never reacted to it: the pulse gradually increased,

and she died on the fourth day. Happily, as one often sees in general peritonitis, the patient had no pain, and very little discomfort.

Here is another case, illustrating even more clearly the difficulties of diagnosis.

Mrs. L. fell ill on Sunday evening. She lives 14 miles away, in the country, and was seen at 12.30 at night. The day before she had travelled from Edinburgh in perfect health, but, when seen, complained of discomfort, and pain which she referred to the right kidney. There was also pain on pressure in this region; she had a dirty tongue and constipation, temperature 100° , pulse 80. Twelve months previously she had had a similar attack, which passed off in two days: the treatment in both cases was sips of hot water and small doses of saline. Her husband was told to wire on Monday, if she were no better. On Tuesday he wired to say she was worse. She was seen at 1 o'clock that afternoon, and there was no doubt that she had appendicitis. Pain was localised over the appendix, and was coming in spasms; temperature 100° , and pulse 100. A tender swelling could be felt by the bowel. By 6.30 p.m., a surgeon was on the spot, and the condition then was practically the same as at midday. The abdomen was opened, a perforated appendix found, and also a great deal of pus, not shut off by adhesions. No one had suspected perforation, an acutely inflamed appendix was the worst we looked for. There had been no sudden pain, no leading symptoms to guide us. Doubtless, had she been seen on Monday instead of Tuesday, the diagnosis of appendicitis could have been made, and a long and tedious illness saved. On the other hand, had the operation been performed a day later, in all probability she would not now be alive. When the wound had granulated up, a second operation had to be undertaken in order to secure a sound abdominal cicatrix, and she was in bed $3\frac{1}{2}$ months.

Perforation and General Peritonitis.—Now, just a word as to the symptoms of perforation. We have already mentioned that it is sometimes impossible to be sure that this calamity has taken place; yet there are certain guides which often enable one to make a diagnosis.

Always be prepared for it in a case of appendicitis, in which

the patient, previous to calling in the doctor, has taken a large dose of purgative medicine. The condition may declare itself by means of pain so violent as to almost produce fainting. This may be followed by a rigor and sudden rise of temperature. Again, with no increase of pain at all, there may be several slight rigors. Lastly, it may be ushered in by an ominous lull in the symptoms, and a cessation of pain and discomfort, so complete as to almost delude one into thinking that the patient has taken a turn for the better. Concomitantly with all these symptoms, there is generally an increase in temperature and pulse rate. In perforation during acute appendicitis, where there has been no time for adhesions to form, the poison may invade the peritoneal cavity with frightful rapidity. In one of our cases the whole abdomen was found full of pus and fluid seven hours after perforation, the intestines showing marks of acute inflammation with adherent flakes of lymph. Another case showed a similar condition in eight hours. In the former case, the diagnosis of general peritonitis could be made; in the latter, there were no symptoms to indicate what had occurred.

The clinical features of general peritonitis, as given in text-books, are somewhat misleading. Vomiting, which is often quoted as a leading symptom, we have practically never seen during the first day or two. In the later stages, with the gut paralysed and distended, this is what occurs: the patient, who, in all probability, is getting fluid by the mouth, takes small quantities of this at intervals for some hours. It collects in his stomach, and none is absorbed; then, perhaps, as the result of some slight movement on his part, the accumulated liquid gushes out of his mouth without warning. There is little or no pain, and the patient feels fairly comfortable and cheerful—so cheerful indeed, that sometimes the friends cannot realise the gravity of his condition.

An operation for perforation with peritonitis usually lowers the temperature, but the pulse-rate, as a rule, does not fall in the same ratio. A subsequent rise of temperature is to be desired, as indicating power to react to the toxin. If the temperature does not rise, and the pulse gradually increases, the prognosis is grave. Shortly before death there is often an ante-mortem rise of temperature. The so-called “wiry”

pulse of peritonitis is seen more frequently towards the end than in the early stages. The board-like rigidity of the abdominal muscles and the distension of the cavity do not develop at once ; on the contrary, the abdomen may be soft, save over the appendix. Persistent hiccough we have only once seen. The typical facies takes a little time to develop, and is not so well marked in a previously healthy young girl or child as in a man who is perhaps sallow and thinner in the face.

We have given these details because it is often hard for the general practitioner to realise the grave condition of his patient, who may be feeling great relief from the operation, which has taken place perhaps two days previously. In the face of the patient's positive assurance that he feels much better, it is hard to give a gloomy prognosis, based on the fact that the temperature is normal, while the pulse has risen from 88° after the operation to 106° or thereabouts. We speak thus strongly because we have seen a consultant, in a case which terminated fatally on the fifth day, give a hopeful prognosis on the fourth day after operation, based principally on the fact of a normal temperature, in spite of other signs pointing to general peritonitis.

Treatment.—There is no medical treatment of appendicitis, and every case should be regarded from the surgical point of view. When one has diagnosed it, the diet should be limited to sips of hot water, and hot applications may be found useful in easing the pain. Morphia may be given, if it has been decided to call in a surgeon ; but if, for any reason, the patient refuses to see a surgeon at once, then it is better avoided.

Operation.—The reasons for advocating immediate operation are as follows :—

(1) It is quite impossible to predict the course of any given case. We have had cases with severe symptoms—*e.g.*, great pain, high temperature, rapid pulse—recover without operation ; we have had a similar case, luckily at the end of our series, operated on within 15 hours, and a gangrænous appendix removed ; a few hours more, and it must have ruptured, and there was not an adhesion to shut off the infection from the abdominal cavity. We have had cases, with less severe symptoms, which, when operated upon, disclosed a perforated

appendix with no limiting adhesions ; we have had others of a like type which recovered when left to themselves. Even in a case which, after running its course for a few days, develops a swelling over the appendix, it is not possible to say whether the swelling will gradually disappear, or develop into an abscess. The risk in this type of case is not so great, for when once a swelling is felt, adhesions may be counted on to shut off the appendix, and so the risk of general peritonitis is lessened.

(2) If operation is delayed till perforation takes place, or an abscess forms, it means a long and tedious illness. Not only that, but in all probability, when the wound, or wounds are healed, a second operation will be necessary in order to get a firm cicatrix. In one of our cases, after the second operation, the wound again broke down, and a third operation was necessary. This patient was in all five months in bed. When a wound in the abdominal wall heals after discharging pus for some six weeks or two months, germs are sure to remain lurking in the scar, and, though the wound is quite healed, when the second operation is undertaken, these germs may re-infect the fresh wound. If one allows two months for the first wound or wounds to heal, and another month for the second operation, if required, we are faced with a serious illness lasting three months. This can often be avoided by immediate operation. It may be said, "Why do the second operation at the end of a long illness?" In two of our cases, the patients were girls about to be married, and, with a view to future events, a firm abdominal wound was a necessity. Also, one finds it far easier to persuade a patient to undergo a second operation, when he has become accustomed to an invalid life. Once let him up, and it is not easy to get him back to bed. We have only once come across a case in which the second operation was omitted. The patient was operated upon in London, two years ago, for an appendicitic abscess ; he has now a hernia which gives him much trouble, and for which he is about to undergo an operation. In some of our cases, the bowel has been directly adherent to the scar, and it would not have taken long for such a hernia to push its way through the thin scar tissue.

(3) It is now generally admitted that, if a patient has had one attack of appendicitis, an operation is indicated on recovery, and, if one can go by statistics, operation at the beginning

of an attack offers few more risks than when undertaken in the quiescent period. Therefore why not insist upon it? It is also the case that, when once a patient has recovered, it may be very hard to persuade him to submit to an operation. In all human probability, two of our cases would have been saved had they taken the advice which was urged upon them after recovering from the first attack. It has been suggested that a first attack, if very serious, may obliterate the lumen of the appendix, and thus safeguard the patient from a second attack. But this is mere conjecture, as the following case will show.

Master S., aged $2\frac{1}{2}$, had an acute attack, with much effusion in the right iliac fossa. This cleared up and disappeared. Both during and after the attack he was seen by a surgeon, who did not advise operation, thinking that, owing to the severity of the attack and his age, the appendix would probably be obliterated. When on a visit to England six months later, he had a second attack, and died of peritonitis, in spite of operation.

In another of our cases, the patient was a visitor, and gave a history of an acute attack six years before, with recurrent slight attacks since then. She had a mild attack when we saw her, and was operated upon a week later. The lumen of the appendix throughout its entire length was almost obliterated, and yet had been the source of trouble for some years.

It may be urged that one's patients will soon fight shy of one if operation is urged in all cases; but our experience does not show this to be the case. Indeed we can say that nowadays the majority of educated persons are as much alive to the dangers of appendicitis as are the members of the medical profession, and are only too glad to call in surgical aid. Should all appeals fail, however, we simply refuse to accept any responsibility for what may occur, if a surgeon is not consulted. It is the duty of the general practitioner to bring the surgeon to the patient before he is in desperate straits, and, if this were always done, the statistics of the disease would afford more pleasant reading.

As in our case, the general practitioner may be handicapped by being in the country, some distance from surgical aid.

Oddly enough we have been further handicapped by the fact that several of our most serious cases have been taken ill on a Saturday or Sunday, and, on the latter day, perhaps owing to the Sabbatical prejudices of our nation, there is no train service in the district. For the wealthy there is always a motor car, but, in the case of a poor patient, the general practitioner must sometimes be prepared to operate in an emergency. This has fallen to our own lot, but it is unnecessary to go into the question of the actual operation here, because we consider that it is one for a surgeon, and should only be undertaken in an emergency by those who are, as we are, general practitioners.

LIST OF CASES.

Class.	No.	Deaths.	Remarks.
I. Perforation of gangrænous appendix, with diffuse suppurative peritonitis.	2	1	Death due to general peritonitis.
II. Perforation of gangrænous appendix, with localised suppurative peritonitis.	2	1	Death due to general peritonitis. He should have recovered, but owing to the attitude of the friends a delay of 15 hours took place after perforation was diagnosed.
III. Gangrænous appendix, without perforation. Fluid in pouch of Douglas.	1		
IV. Abscess of appendix, one case involving Fallopian tube.	6	1	Death due to shock. Patient had had repeated attacks, and had always refused operation. The operation, when done, was very long owing to the numerous adhesions, and the patient was in a very weak state.
V. Operation in quiescent period after one or more attacks.	15		
VI. First attack; not operated on.	8		One patient has already had a second attack and died, away from home, of general peritonitis.
Total - - -	34	3	

THE TREATMENT OF RELAPSING, RECURRENT,
AND CHRONIC APPENDICITIS.

BY JOHN ALLAN, M.D., CH.B.

ATTEMPTS have been made, from time to time, to classify the different varieties of appendicitis, but even yet there seems to be no unanimity of opinion as to a scientific classification for this disease. The term chronic appendicitis is loosely applied by some to include cases of appendicitis which are radically different, and quite distinct from one another. For instance, many would include under this term all chronic cases, and relapsing, and recurrent appendicitis. I hope to show that symptomatically, pathologically, and therapeutically, relapsing, recurrent, and chronic appendicitis are quite distinct.

Objection has been taken, in some quarters, to the use of the terms relapsing and recurrent appendicitis. Mr. C. B. Lockwood¹ has condemned the employment of such terms. He bases his contention on the fact that the terms give no indication as to the pathological conditions present. While that may be true, it is also true that, if there is relapse or recurrence, there must be some morbid change to account for this. Such an eminent surgeon as Mr. Rutherford Morrison² writes "a tender nodule, or a variety of uneasy sensations, or marked tenderness left after an attack, demands operation. Relapse or recurrence of the illness is due to permanent pathological changes in the appendix, and indicates excision as the safest treatment." I think, nevertheless, that, from a clinical point of view, relapsing and recurrent are most convenient terms. They constitute two distinct varieties of appendicitis, and differ as regards symptoms, prognosis, and treatment. While I should take up the uncompromising attitude of advocating operation in all cases of relapsing appendicitis, I should not advise such in all cases of recurrent appendicitis. My reason for doing so is because in the former the pathological process never settles down, while in the latter it does.

Let us just for a moment consider two such cases and compare them. In the first instance, a patient has an attack of appendicitis, perhaps of an acute nature, or it may be that the attack from the first is of a subacute character. Be that as it may, one finds that the acute symptoms gradually subside, and the patient is able to get about again, as he will not lie

in bed for an indefinite period when free from pain of an acute character. Now careful inquiry in these cases will elicit the information that the patient has an aching pain in the region of the appendix, and, on examination, one will probably be able to detect some thickening in the right iliac fossa, while deep pressure over that region will demonstrate the presence of a tender area. The temperature may be normal, and the pulse rate not raised at all, or only very slightly. If the appendix could be seen, it would be found to be in a state of inflammation, its mucous membrane thickened and red, and very likely ulcerated. My argument is that such a patient is in a very precarious condition so long as this continues, and that therefore the appendix should be removed in one of the quiescent intervals. In these relapsing cases, there are generally acute exacerbations from time to time, and any one of these may place the patient's life in jeopardy, and so the acute attack should, if possible, be tided over by careful medical treatment, the patient's general condition improved so far as possible, and appendicectomy performed when the inflammatory condition is in a state of comparative quiescence. These relapsing cases constitute a very dangerous class. They are cases in which it is most important that the patient should rest, and not indulge in violent exercise when the attack is subsiding. When the acuteness of the attack is over, it is probably best to wait for about three weeks before removing the appendix, because, as has been stated, any bacteria at work outside the appendix will probably have died out, and there will be little or no reason to fear peritoneal infection. In the event of a fresh attack of a very acute nature supervening while the patient is waiting, the operation should be proceeded with at once. These patients require most careful watching, so that any danger signal may be at once noted, and appropriate treatment promptly applied. One might feel inclined to send such a patient away in order that his general health might be benefited. It is, however, not advisable to send such a case into a small country district, where a skilled operator is probably not at hand, as one never knows when disaster may overtake the patient.

Not so very long ago the following case, which I now describe, came under my notice, and in it we have well exemplified my contention of the very dangerous nature of this variety of appendicitis. L. W—, a mill girl, 21 years of

age, was admitted to hospital about the beginning of March for the purpose of having an appendicectomy done. The following history was obtained. Six weeks previously she had an attack of appendicitis, which was treated by medical means, under which the acuter symptoms subsided. She got up at the end of three weeks, and, a day or two later, started work again. She did not suffer any acute pain, but always had some uneasiness in the right iliac fossa, and occasionally attacks of slight pain in that region. After being at work for a week, acute symptoms again supervened, and she was treated as before. Her medical attendant strongly advised her to have her appendix removed, and she consented to this, and was admitted as stated above. She had been in bed for about ten days at home before coming into hospital, so that the acute attack had almost subsided. Her state on admission was as follows: She complained of slight pain in the appendix region: on palpation, tenderness on pressure was elicited over this area, and there was distinct thickening: the temperature was 99° F., and the pulse rate 88 (probably faster than usual). Her bowels were very constipated. The patient was put on low diet, the action of the bowels solicited by means of enemata, and a mixture, containing sodium bicarbonate 5 grains, infusion of rhubarb 1 drachm, and tincture of belladonna 5 minims, given every four hours. Ten days later, or three weeks from the commencement of this second acute attack, the operation was undertaken. The appendix was found to be inflamed, its walls were friable and ulcerated, and when the surgeon was separating some adhesions, the base of the appendix gave way, and a minute opening was left in the cæcum. This was closed, the appendix removed, and a small drain put in for 48 hours for safety. During the first 24 hours after the operation, she was given nothing but hot water; then, for the next day, she was given albumen water, and afterwards diluted milk, etc. The bowels were opened on the fourth day, after which she was allowed more solid food. Her progress afterwards was all that could be desired, and she was discharged about five weeks after the operation.

Now the state of this appendix was serious for the patient, and, at any time, she might have been placed in a very critical condition. Had this patient been going about, is it not possible that the appendix might at any moment have become per-

forated? A few months before, I saw another case, in which the clinical picture presented was practically identical with that of L. W—, but in which the morbid changes were not quite so acute. This patient was a youth, 20 years of age. He had an attack of acute appendicitis, and, when the acuter symptoms disappeared, there remained a feeling of heaviness or uneasiness in the right iliac region. The pathological changes found in the organ at the operation were inflammation and ulceration, while the appendix was acutely bent on itself. The walls, however, were not soft and friable as in the case recorded above.

Now let us turn to the cases of recurrent appendicitis. In these cases, the patient has an attack, and, in ten days' time, he is apparently cured—that is to say, that, at the end of that time, he is quite free from symptoms, and physical examination fails to demonstrate any abnormality. It would be going too far to say that the appendix in such a case would be found to be in a perfectly healthy state, but it may safely be asserted that, judged from a clinical standpoint, the patient can be said to have recovered from the attack. In those cases I should certainly not advise operation after a first attack, except in special circumstances, to be hereafter mentioned. If, however, attacks recur, even though there are longer or shorter intervals of perfect health, then the indication is undoubtedly for removal of the appendix in one of the quiescent intervals. The constantly recurring attacks indicate that there is some abnormal condition in these appendices, and, from the fact that the pain is often paroxysmal in character, there may be found some constrictions in the appendix, or perhaps its cæcal end may have become sealed up, or it may be acutely bent on itself—some condition, at any rate, which interferes with the free flow in and out of the appendix, may exist.

As in the last variety so also in this, there is always the danger that the next attack may be of such a nature that the patient's life may be lost. Much discussion has taken place as to how many attacks of appendicitis a person should be allowed to have before removal of the appendix is advocated. On the one hand, most surgeons would advise removal of the appendix after one attack of appendicitis; while, on the other hand, most general practitioners (who doubtless see far more cases of this variety than do operating surgeons) would probably not advise

such a course after one attack. Whatever opinions may be held, there appear to be many points to be considered in deciding this question, and there are also certain definite indications when removal of the appendix after a first attack would seem to be advisable. If the patient were going for a long sea trip to some place where medical aid could not easily be obtained, one would be inclined to strongly advise removal of the appendix after a first attack. After a second attack, the question of surgical interference becomes more urgent, and if the second attack is of greater severity than the former, the advisability of such a course should be very strongly impressed upon the patient. In the event of the second attack being of less severity than the former, it might be advisable to wait, as it would seem reasonable to conclude from such that the inflammatory reaction was less violent, and that the case might in time undergo spontaneous cure. As a general rule, increased severity in recurrent attacks is a strong point in favour of operation, but decreased severity, in such circumstances, would rather indicate medical treatment. If the patient were in a position to, and willing to, undertake prophylactic measures, such as careful dieting, attention to the bowels, etc., then removal of the appendix need not be a matter of such urgency. The age of the patient must also be taken into account. One would, as a rule, rather incline to advise removal of the appendix after a first attack in a child, because, in children, the peritoneal defence is less strong than in adults, and because one could never hope to get prophylactic measures carried out with any degree of certainty. Again, many of the large insurance companies now refuse to accept, as first-class lives, persons subject to attacks of appendicitis. With the knowledge that the risk of an interval operation is practically nil, one need have no hesitation in advising surgical interference in such circumstances. Lastly, it may be asked, "Should persons, who are subject to appendicitis, and who are about to enter the Services, have their appendices removed before being admitted?" Mr. Bowlby³ has recorded a case, in which a soldier, who had an attack of appendicitis, was given the option of having his appendix removed, or of being discharged from the Army. There is certainly much to be said in favour of this, for the soldier's life, when on active service, is undoubtedly a hard one, and is not an ideal one for guarding

against attacks in the future. He has violent exercise, long marches, often damp sleeping quarters, food not always above suspicion.—all of which may act as contributory causes towards an attack of appendicitis, should he have any tendency that way. Similar remarks may be applied to sailors, and to those who spend their lives at sea. The safe policy would be to advise appendicectomy before entering the Services, for, though medical aid may be at hand, the operation would have to be done in less advantageous circumstances on the field or on board ship, and the risk would consequently be greater.

The clinical features of this variety of appendicitis are so well known that it is almost superfluous to give illustrative cases. Suffice it to say that the attack is generally a sharp one, of fairly acute nature, in contradistinction to the variety of appendicitis to be discussed below. It may be ushered in by vomiting, there is considerable pain in the right iliac region, tenderness on pressure over that area, and perhaps a fulness, or slight tumour, may be detected on palpation of the region referred to. The temperature is raised, and the pulse rate increased, while the bowels are almost certain to be constipated. Subsidence sets in, in from 24 to 36 hours, and, in a week or ten days, the patient has quite recovered from the attack. Recurrence may take place in 6 or 12 months or perhaps at a longer interval. At any rate, the recurrence indicates that there is some permanent pathological process in the appendix, and one can best consult the patient's safety by advising appendicectomy in one of the quiescent periods.

Let us now consider the variety which has been designated chronic appendicitis.

At the annual meeting of the British Medical Association in 1904, Dr. Blair Bell⁴ of Liverpool discussed the matter, and elaborated his views on the subject. In these cases, there are constantly recurring attacks of pain, which would rather appear to be of the nature of a gastric condition. In these, Dr. Bell advocates removal of the appendix, but this drastic course is by no means universally accepted. For my part, I agree with Dr. Bell, when he says that many cases, which have been set down as chronic dyspepsias, are really cases of appendicitis; but I differ from him somewhat as regards treatment.

These patients suffer periodically from attacks of abdominal pain, which commences in the epigastric region, but

which later tends to become localised in the right iliac fossa. The pain is generally slight, and is rarely of sufficient severity to make the patient keep in bed. Abdominal examination will reveal slight tenderness on deep palpation over the right iliac region, as a rule over a *very limited area*. There is no tumour, the pulse rate is not raised, and the temperature is normal. The bowels are invariably constipated. It is not surprising that many of these cases are missed, and are described as "attacks of indigestion" or "bilious attacks." Probably a considerable number of such patients never come under the supervision of a medical man, because the severity of the attacks is so slight. Dr. Bell appears to associate many such attacks with the free indulgence in very rich foods.

I am not at all convinced of the necessity of operation in every case. If the dieting is carefully attended to, if the bowels are properly regulated, if the patient will take healthy but not too violent exercise, if in fact he will lead a life under proper hygienic conditions, there should be no necessity for operative interference. Provided that a patient cannot undertake measures to try to ward off future attacks, and that he has these attacks frequently, one need not hesitate to advise appendicectomy in a quiescent interval.

The following case, seen over four years ago, will serve to illustrate this variety :—M. V., a domestic servant, 22 years of age, had suffered for over two years from attacks of this nature. She had had at least four attacks, probably more, the attacks coming on at intervals of four or five months. They came on after her day's work when she was specially tired. Pain was first felt in the stomach region, but, within 24 hours, it became localised in the lower half of the right abdomen. The attacks lasted for three or four days, but she never had to lie up; the bowels were always confined. She did not consult a medical man until the last attack, in May, 1904. After hearing the history of the case, the doctor advised her to have her appendix removed. She was admitted to hospital, and the operation was done about ten days after the subsidence of the attack. The appendix walls were found thickened, the lumen was narrowed, and there was a constriction about the middle of the organ. The wound healed by first intention, and she was discharged in a month's time.

In all these varieties of appendicitis, there may be con-

siderable deterioration in the patient's general condition, both bodily and mental. There is often marked anæmia associated with these cases, and in some it is so severe as to almost contra-indicate operation. The constant relapses may reduce the patient to a condition of a chronic invalid, and render him unfit to follow any occupation, or the patient may be prevented from following a special employment, unless he can consider himself free from the possibility of another attack. Again, the constant annoyance and worry of each recurrence, or relapse, are bound to exert a bad influence on the general health. In people of nervous temperament, there is a possibility of these attacks preying on their minds, and this may, in the long run, lead to some mental aberration. So some people, harassed by frequent attacks, and driven almost to despair, may give way and end their miserable existence. Personally I have never seen this extreme picture illustrated in appendicitis cases, but in all cases in this group which have come under my notice, there has been deterioration in the general health, and, in most, the constant worry has tended to upset somewhat their mental equilibrium, shown either by increased irritability, or by brooding and melancholy.

It has been shown above why it is not advisable to send relapsing cases into a small country district to recruit prior to operation. The same restriction need not be applied to the other two varieties, because, provided that ordinary care is taken, the risk of an acute exacerbation is infinitesimal. In all cases every endeavour should be made to bring the patient's general health into as good a condition as possible before operating. The diet should be nutritious and easily digested, the regular action of the bowels should be solicited, and tonics, such as iron and arsenic, should be given. The risk attached to operation in the quiescent period is very small (probably not more than $\frac{1}{2}$ per cent.), and appendicectomy, in the circumstances mentioned above, affords a safe, sure, and efficient remedy for the disease.

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THE PRINCIPLE OF PROPORTIONAL REPRESENTATION IN CLINICAL RADIOGRAPHY.

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NOT only does a radiograph of any part of the body need interpretation singly, but it may require to be compared with other radiographs of a corresponding part in other individuals. In comparing one of the members of such a series of radiographs with another, it is sought, from differences on the plates, to infer real differences of the parts projected, more especially of such internal organs and structures as are otherwise out of reach at the time of taking. An inference from the radiographs to reality can be valid only when certain precautions have been taken, namely, that corresponding parts be radiographed under precisely similar relative positions of object, plate, or screen, and radiographic centre of emission. To such a statement no practical radiographer is likely to take exception; yet it seems to me that, in the attempts made up to now to adapt the radiographic art to systematic, as distinguished from occasional, clinical uses, one essential principle has been almost entirely ignored—namely, that (for trustworthy comparison of corresponding parts that sensibly differ in size) the distance of the radiographic centre from the parts to be represented should, in the first instance at any rate, be not kept fixed, but uniformly proportioned to the size of the parts. In other words and more generally stated, corresponding parts of objects differing in size must be radiographed under the same angles in each case, if the resulting radiographs are to be truly comparable one with another, and if they are to be of real use in detecting, and perhaps measuring, actual deviations from the normal proportions of the parts themselves.

The possibility at all of clinical radiography rests on the underlying assumption, till it is disproved, that in persons, who are about the same period of life, and who are of the same sex, and of the same degree perhaps of fatness or leanness, but who differ in size, the corresponding regions of the body,

and the contained organs, are in the geometrical sense similar to one another in their dimensions (that is, enlarged or diminished models of each other) except in so far as their proportions may be altered by the effects of disease or injury. This assumption is probably rarely quite true over the whole body ; but is probably approximately true in reference to the bones and bony distances of such parts of the axial and appendicular skeleton, and to such organs as the heart and (upper limits of) the diaphragm as are likely to come within the purview of the radiographer. According to this assumption, normally, we are entitled to regard any one bone, or any articulated collection of bones, in one person as similar in shape, whether equal in size or not, to the same in another person, each to each. Further, if we take a pair of frozen, or otherwise freshly hardened, bodies of the same age, sex, and build, but differing in size, and if we make, in any direction, corresponding sections through identifiable anatomical points in each, we would expect, after drawing straight lines between corresponding points on the face of the corresponding sections, to find the triangles thus constituted in the larger or smaller subjects similar (geometrically similar) to the corresponding triangles in the other, each to each, in every pair of similarly situated sections made. Provided that we did not make our triangles too small or too numerous, any dissimilarity observed would be the mark of abnormality. It is on this principle of normal similarity that the clinician relies when he percusses out, and marks on the chest of his patients, the outlines of deep and superficial dulness ; though, of course, the methods of projection and the surfaces of record being different, there is no means of direct comparison between the percussion outline and the radiographic delineation in the same patient.

If this fundamental assumption is found untrue, then there is an end at once to any very exact use of radiography by the clinical physician, or by the clinical surgeon. Nevertheless, for the purposes of the present argument, it is held to be *prima facie* true, and my contention is that, in taking radiographs for purposes of comparison, similar parts that differ in size must be X-rayed under equal angles—that is, at an axial distance of the radiant centre of emission of the focus tube from the

parts equally proportioned to the size of the parts; in other words, the same multiple of some corresponding definite dimension of the part in each case. To put the matter very briefly, we might otherwise find similar parts throwing dissimilar shadows.

As with ordinary shadows, we are concerned in the case of X-rays with the projection of a more or less transparent solid on a plane (plate or screen) from a point, in this case the anti-cathodal centre of emission of the focus tube (radiographic centre = R.C.). Broadly speaking, a radiographic axis is any straight line through the radiographic centre within the luminous area; there is, in fact, a limited infinity of such. As a rule, however, by the "radiographic axis" is meant one or other of two distinct axes. First, when the radiographic centre is brought into line with two selected and readily identifiable anatomical points, and kept in that line in any series of radiographs, we have an anatomical axis, or radiographic axis, of identification (R.A.I.). Secondly, in the shortest distance of the radiographic centre from the plane of delineation (P.D., plate or screen),—that is, the radiographic axis perpendicular to the plate at the time of taking—we have the radiographic axis of projection (R.A.P.). When these two, the radiographic axis of identification and the radiographic axis of projection, are made to coincide in direction (and by the use of the horizontal table, and of the plumb line, and a little ingenuity they can be conveniently made to coincide, and ought to be made to coincide in all systematic radiography) we get the radiographic axis *par excellence* or principal radiographic axis (P.R.A.), corresponding with the principal visual axis (P.V.A.) produced of ordinary perspective.

In what follows it is to be understood, unless otherwise mentioned, that the radiographic axis of identification and the radiographic axis of projection are invariably made to coincide in direction; and that, for the sake of brevity, unless otherwise stated, the word centre is equivalent to the radiographic centre, and the word axis equivalent to the principal radiographic axis, both as defined above (namely, R.C. and P.R.A.). I hope, when the existing confusion of both theory and practice as to the different radiographic axes is cleared up, that a further step in simplification will be taken, and

that, by universal agreement, the point where the principal radiographic axis meets the plate or screen at right angles (the point of sight of ordinary perspective) will be made coincident (as in ordinary photography) with the centre of the plane of delineation (C.P.D.), that is, with the point of intersection of the two diagonals of the rectangular plates or screens as ordinarily used.

It can be proved geometrically that the projections, that is, the shadows or geometrical outlines, of similar solid figures upon parallel planes are similar (and may be equal) if the external projecting points (centres) are similarly situated to the figures, which may of course much vary in size. A projecting point is similarly situated in regard to each figure, when each of them is in line with any two corresponding points of the respective figure (on the same side of it), and at a distance from the figure an equal multiple or sub-multiple of some one corresponding dimension of the figure. The plane projections must be dissimilar, if the projecting points, or the planes, fail to fulfil any one of the conditions enumerated, without any dissimilarity existing in the solid figures themselves. Further, it can be shown that, where the points of projection are similarly situated, the angles subtended there by any pair of corresponding points in the similar figures, or in their projections, in one case are equal to what they are in another, each to each.

In the case of the human chest, submitted for diagnosis to the radiographer, we have an object or solid figure which, if visible, would roughly resemble a well dissected chest, with the lungs removed, the bony framework coherent and intact, and the heart *in situ* and pulsatile, *mobile in mobili*. Though no doubt the principle of proportional representation has very important surgical applications generally, I shall try to confine my remarks to such an object as what may be called the "Röntgen thorax." Given two human chests, externally similar, but differing in size, and one of them known to be normal in its proportions throughout, we cannot determine by radiographic means the presence of a real dissimilarity of the heart, or other internal parts, from any dissimilarity upon the plates themselves, until we have secured that the centre has been, in each case, similarly situated to the two chests at the time of taking,

the other better known conditions for trustworthy comparison, of course, also having been observed, such as parallelism of the plates, similarity in phase of thoracic movement, and the like.

From existing chaos, two accepted methods of clinical radiography have emerged, in addition to the roundabout method of orthodiagraphy, confused together under the name of the method of fixed distance. In the one method of examining the same part in different subjects which may differ in size, the distance of the centre measured along the axis from the subject is kept fixed throughout the series. In the other is kept fixed the distance of the centre from the plane of delineation, this distance too as measured along the axis. If all corresponding regions examined were of the same size, at least externally, then the geometrical conditions, enumerated as necessary, would be fulfilled, and the radiographs would be so far comparable that any observed dissimilarity of internal parts on the plates would be diagnostic of a real dissimilarity in the internal parts themselves. We should in fact have the same certainty of inference, as is practically obtained, when we radiograph the two sides of the body simultaneously on the same plate, by means of a focus tube situated with the centre in the mesial plane. But so far as the two methods of fixed distance ignore sensible difference in size of parts, which are externally similar, and may be similar throughout, it is found in practice that, when the distance of the centre is kept fixed, a comparatively small inequality in size of parts similar in shape may produce marked dissimilarity on the plates, without any real dissimilarity in the parts projected. Moreover, after the first start, marked dissimilarity must take place between the plates taken by each method, with the same objects taken, even. For instance, where the distance of the centre from the patient is kept fixed throughout a series of observations, any increase in the size of the patient will increase the distance from the centre of the plate in contact with the patient on the far side. Contrariwise, if the distance of the centre from the plate is kept fixed, any increase in the size of the patient will diminish the distance of the centre from him. The term "fixed distance" is, therefore, not only ambiguous, but also something of a misnomer. In either

method, the dissimilarity to be observed on the plates may be due, not to dissimilarity of the parts themselves, but, for all we know, to the dissimilarity of the situation of the centre from the parts, even where other more obvious sources of error have been avoided. Thus, under the ordinary conditions of exposure of the human chest, a disproportionate increase in size of the shadow of the heart, in any particular dimension, might be due to a proportionate and normal increase in size of the organ projected; while a disproportionate increase of size of heart, in a smaller subject, might give no increase of shadow as measured along the corresponding dimension of the shadow on the plate. The shape of the shadows might differ on the plate, while the original organs themselves might actually be of normal proportions. Thus also the X-ray shadows of such complicated joints as the hip or knee might greatly vary in outline upon plate or screen, with no real difference in the originals in shape, but only in size. That this is so, we might very readily test by projecting the shadows of the articulated skeletons of these joints upon a white screen, in a dark room, by means of a small lighted taper. It must often be useful to compare such a shadow in the open with an ordinary radiograph of the part.

There is another somewhat more theoretical reason why methods of the fixed distance type must be fallacious, more especially where there is great difference in the size of the parts projected, and that is that it is a different set of contours which are projected to form these outlines on the plates. It might be that we were really seeking to compare non-corresponding parts, as it were, of corresponding regions, the internal organs and structures sought to be portrayed being, as a rule, not angular, but rounded or even globular. In reference to stereoscopic radiography, this peculiarity has not yet, I think, been sufficiently investigated.

So long as, for clearness and sharpness of outline, it is technically necessary to keep the plate in contact with the parts to be taken, only one other method is possible, namely, the method proposed of proportional representation. Here, in the case of parts to be compared, which are externally similar, but which differ in size, the centre is moved to and fro along the axis till it is at a distance from the part the same

proportion, in each case, to the part, that is the same multiple, or submultiple, in each case, of some anatomically well-defined dimension of the part to be taken. What that multiple, and what that dimension should be, must be determined in any series by practical exigencies as regards the part, and as regards the effective range of the tube. But, when once selected, the dimension and its multiple—the proportional distance of centre from object as measured along the axis—must be adhered to throughout the same series of observations. It would be convenient to note, at the time of taking on the plate, the dimension chosen and the multiple or submultiple used. Dissimilarity in the outlines of internal parts, recorded on the plate, would then be valid grounds for inferring some real difference of proportionate size, shape, or position in the internal organs; and similarity in outline on the plate would likewise entitle one to conclude normal proportion dissimilarity in the actual organs portrayed.

When the outlines on the plates are similar to each other, and the plates or screens are in contact with the parts to be taken, and the centre is distant from the parts thus proportioned to the size of the parts, then also, obviously, the distance of the centre from the plates or screens is also similarly proportioned to the size of the part, that is at a distance some other multiple of the same selected dimension, but kept unvaried throughout the series.

Again, if the distance along the axis of the plate from the centre is made equal throughout the same series of observations, then, when no disproportion exists, the objects X-rayed would not only be similar in outline, but equal in every respect, and the similarity, or the dissimilarity of internal parts, could be tested by superposition. This, of course, is impossible in practice, at least at present, owing to the image on the plate losing its sharpness and intensity when not kept in contact with the body at the time of taking. Nevertheless, by appropriate photographic means, the plates can be diminished or enlarged to any the same size we please, say to lantern size or less, by means of the ordinary reducing camera. Thus it will be possible to carry the future radiographic atlas in one's waistcoat pocket.

Difference between corresponding portions of bodies to be

compared, implies some difference in proportionate size, in shape, or in relative position of the constituent parts, one or more of these alterations being, it may be, present at the same time. So far I have endeavoured to show that in the case of corresponding regions of the animal body (externally similar, but differing in size), the dissimilarity of internal parts cannot be radiographically diagnosed as actually existing, till the precaution has been taken of uniformly proportioning the distance of the centre (as measured along the axis) from the object in each case, in accordance with some one particular well-marked dimension of the object determinable from the outside. But I think that dissimilarity being thus definitely proved in the first instance to exist, it would be found possible by radiographic means to proceed a step further, and to determine, for example, the ratio of size of the dimension of an enlarged organ like the heart to the size of the corresponding dimension of the normal organ, or of some standard organ, as is done by orthodiagraphy. For such a proceeding one or two simple preliminary assumptions require to be made.

In the case of such an organ as the heart, these assumptions are (1) that the enlarged organ is similar in shape to the normal one; (2) that the enlargement takes place in such a way that the straight line, joining any two points in the enlarged organ, is parallel to the line joining corresponding points in the other; and (3) that the enlargement takes place proportionally along lines of direction passing through a point, which may be called the centre of enlargement or fixed point of the organ. The centre of enlargement, wherever it is, is a point, or small area, which maintains the same relative position to the normal parts of the region X-rayed, as the corresponding point of the organ maintains in the normal individual. The anatomical position is not yet certainly known in the case of the heart, but may hypothetically be presumed to be somewhere in the median plane of the body, towards the upper and back part of the chest, adjacent to the front of the nearest dorsal vertebral body; and, when found, to lie on a line joining some superficial, identifiable bony points, respectively anterior and posterior.

If, in the case of a heart suspected to be simply enlarged,

and of a heart known to be of normal proportions, we could pass the axis in the same direction, as regards the external landmarks, through the centre of expansion in both, and if we could make the angles, subtending the hearts in the two cases at the radiographic centre, equal respectively, then it would be possible, by a very simple formula, from the resulting radiographs to calculate the ratio of any linear dimension in one organ to the corresponding linear dimension in the other, provided that we could actually ascertain the actual distance in inches along the axis of the centre of expansion from the superficial landmarks in the normal (or any normal) chest. Of course, if we knew the actual length of any dimension of the normal heart in inches, we could at once, on the assumptions of this paper, give the length in inches of the corresponding dimension of the simply enlarged organ. Non-correspondence of the shadows (that is, dissimilarity) under the latter conditions (that is, of equal angles at the radiographic centre) would of course argue some change of shape, or alteration of position, in the way of twisting in the suspected organ; that is something other or more than simple increase in size.

Practically, it seems to me that it would be a comparatively easy thing, when we have X-rayed a suspected organ under certain angles at the centre, to radiograph a person, with a normally proportioned organ, under the same angles for purposes of comparison. It might be possible to do so with the screen simply, and a little dodging, or it might be done by the use of some very simple apparatus, much simpler for instance than the Orthodiagraph. But details of practical method would be easily devised when once the principle of proportional representation is grasped.

Another matter in this connection is worthy of mention. In radiographing a segment of the body for diagnosis, we virtually run a sheaf of sections simultaneously through the parts of the body under examination, these sections being innumerable and radiating through the axis. At the same moment, as it were, we project from the centre a sort of linear image of some of the contents of each intervening section upon the intersecting plane of delineation (plate or screen) by means of such of the rays as may survive the obstacles in their path.

If we actually had a few happily chosen hardened sections of the human chest passing through an easily indentifiable axis (which last was fortunately directed through the fixed point of the heart) then, in the plane of such a hardened section, or on the margin of accurate drawings of such, we should be able, by a very simple geometrical construction, to directly compare the linear dimension of the enlarged organ, in the corresponding plane, with the corresponding dimension of the normal organ, using the elements of the single radiograph of the suspected organ alone, without the necessity of re-radiographing the normal. No doubt these things will be done more easily on paper than in reality ; but it will be time enough to worry about details when the principles have been swallowed and digested.

With apologies for a great deal of repetition, for the whole matter really lies in a nutshell, I am emboldened to put these suggestions (for proof or disproof) before other workers, more fortunate than myself in having at their disposal the *clientèle* and the *matériel* of a public hospital appointment, by the fact that, in none of the numerous, costly, beautiful, and sumptuous text-books and atlases of radiography, is there any allusion whatever to the principle of proportional representation. Yet it seems to me that this principle will turn out to be of great practical value in the radiographic comparison of similar objects, that greatly differ in size, or that, though not much different in size, are of large size compared with the distance of the centre from them.

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HODGEN'S SPLINT IN PRIVATE PRACTICE.

By GERALD C. F. ROBINSON, F.R.C.S.

THE difficulties of treating fracture of the femur in general practice are considerable, and the methods used many and various. Of all the splints described in text-books, not one is applicable to every case, and each has some serious drawback which detracts from its value.

Most splints consist of long pieces of wood firmly fixed to the patient, and often to the bed itself, making satisfactory nursing an impossibility, which means two months' discomfort for the patient. Another point common to most splints is that the site of fracture is covered up and pressed upon by boards and bandages, impeding circulation and preventing any local treatment, which, in a fleshy part, like the thigh, is very important.

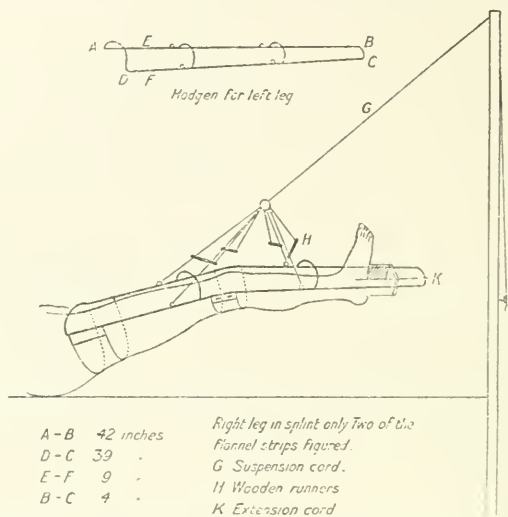
There is one splint, however, invented by Hodgen, an American, which has many advantages and few drawbacks, and which is not used nearly so commonly as it deserves.

Any man, who is able to use a soldering iron, can make it for himself in a short time for the small cost of one shilling. When once made it is practically indestructible, easily sterilised, and applicable to almost every fracture of the femur that can occur.

In order to make the splint, 9 feet of fencing wire, $\frac{1}{4}$ inch thick, is required for the framework, and a few feet of wire half that thickness for the arches, which should be two in number and so placed that they divide the length of the framework into three equal parts. Lastly, the wire loops should be soldered to the frame, 1 inch above the attachment of each arch; loops are preferable to the hooks usually sold on these splints.

The top end of the splint should be 9 inches wide, the lower end 4 inches. The shorter of the two limbs should be 39 inches long and the longer 42 inches (this size will fit the majority of legs). The width of the splint can be altered to some extent, if required, by bending up or flattening out the arches. The diagram represents the splint with measurements.

In order to apply the splint, a stirrup is fixed with strapping below the knee, having a piece of wood at its centre, 3 inches square ; this is wide enough to prevent pressure



on the malleoli. A cord K is passed through the wood and fastened to the wire midway between B and C, so that when the splint is laid upon the leg with the cord K taut, A lies on the anterior superior spine, and D lies above the tendon of the Adductor Longus. The frame is now bent to the degree of flexion of the knee, which is the most comfortable for the patient, quite irrespective of the position of the fragment which has to be adjusted later, when the extension is being exerted. As a rule, no anæsthetic is required at this stage, and often none is required at all, for, when the splint has been properly applied, the position of the fragments will be found perfect ; if, however, one fragment is engaged in the surrounding muscles, an anæsthetic will be required later, but the splint can be applied first with very little inconvenience to the patient while the limb lies supported on pillows.

Strips of flannel are now fastened along the inner limb of the splint by one end and passing under the leg, the other end is fastened by pins to the outer limb, adjusting them roughly at first to form an even trough for the leg to lie in. Cords are now tied to each loop on the frame, and a small wooden runner, 2 inches long, threaded on each. The free

end of each cord is passed through a curtain ring, then through the other hole in the runner, and a knot tied.

At the foot of the bed an upright pole is fixed, having a notch cut in its top, which should be 7 feet from the floor; a cord G is fastened to the curtain ring passed over the top of the pole, by pulling on this the leg is raised about 10 inches from the bed, and the cord made fast to the bedstead.

The flannel strips are now adjusted more accurately, and the splint more bent or straightened, as the case may be, so as to bring the axis of the lower fragment exactly into line with the upper. It is at this point that an anæsthetic may be required, it is not often necessary, but reduction of the deformity cannot always be completed without one. Each of the four short cords can easily be adjusted by means of the runners, and should there be any tendency for these to slip, a pin, passed through the cord above, will prevent it.

The foot of the bed should be raised on blocks 6 inches high, and care taken that the end of the splint swings free of ironwork and post. The weight of the limb is the extending force, and the little piece of cord beyond the stirrup is the index of efficient working. It should be always taut.

There are two important points to be borne in mind. The patient must not be allowed to slide down to the foot of the bed, and the top end of the splint must ride an inch clear of the groin. The wire of the splint should not touch the patient at any part. When the fracture is close to the hip joint, very particular attention must be paid to the flannel strips at the top of the splint, as these are the support of the upper fragment. The top edge of the flannel should accurately fit into the gluteal fold, and care taken lest the strips slip down the wire framework. When all the strips are adjusted, they should be sewn on to the splint with thread and the pins removed.

Gentle massage of the thigh, including the seat of fracture, should be started the day after being put up in the splint; this accelerates absorption of extravasated blood, and assists the circulation round the fracture, keeping the muscles from becoming adherent, and maintaining their tone, thus materially shortening the period of weakness for the patient when he begins to first walk about.

There are two disadvantages in the use of this splint, the

main one is the necessity for an extension fixed to the leg with strapping, this is sure to drag sooner or later, and requires renewing, also watchfulness is required in order to prevent the strapping from cutting into the skin. The other disadvantage is that the foot and leg are not easy to keep warm in the winter, suspended as they are in mid-air ; this can be remedied by keeping up the temperature of the room, by regular massage, and by layers of cotton-wool. Advantages are many :—

(1) The patient can be moved about freely without damage to the fracture, simplifying the nursing ; (2) the patient is perfectly comfortable when he gets used to the inclination of the bed ; (3) no pressure is exerted upon the site of fracture which can be examined at all times ; (4) massage can be begun at once ; (5) swelling of the leg is reduced to a minimum by the elevation of the limb ; (6) the apparatus is cheap and lasting. Two Hodgen's, right and left, will last a lifetime, and do away with the necessity for a multitude of other splints.

Three kinds of injury to the femur are not suited to treatment by Hodgen's splint, two of them occur in children, the one is reparation of the lower epiphysis, which requires complete flexion for its reduction (Hodgen's splint will not perform its functions if bent beyond a right angle). The other includes all kinds of injury in children too young to lie still, whose limbs are not heavy enough to make a good extending weight ; these are best treated by suspension or in Bryant's double splint.

Lastly, fracture complicated by any injury to the leg which prevents the application of a strapping extension ; in which case straight wooden splints, like Liston's, must be used, or treatment by position with pillows and sandbags.

A very bad extracapsular fracture, which was so painful that no splint of any kind could be tolerated, treatment being carried out with sandbags and cushions, and a woman, with delirium tremens and alcoholic neuritis, with a simple fracture of the shaft, are the only two cases in my experience in which Hodgen's splint has failed to give a good result.



NOTES FROM FOREIGN JOURNALS.

TREATMENT OF CHRONIC CONSTIPATION.

Liebmann has observed in a series of cases of constipation in women that there are obvious signs of enteroptosis. Wearing a broad belt with a pad, so placed as to prevent ptosis of the large intestine, gave in many of these cases a surprising result, for, after being applied for three or four days, daily action of the bowels returned spontaneously and permanently.—(*Wien. Klin. Wochenschr.*)

GELATINE IN INFANTILE DIARRHŒA.

Péru recommends gelatine as a remedy for the summer diarrhœa of children, gastro-enteritis due to improper feeding, dyspepsia accompanied by spasm of the pylorus, and dysenteric entero-colitis. The gelatine must be sterilised in the autoclave at a temperature of 120° C. Ten grammes of gelatine are dissolved in 90 grammes of water. The solution is filtered and then poured into test-tubes, which are plugged with sterilised wool. The solution on cooling forms a jelly. For use the tubes are warmed in a *bain-marie*, and the contents poured into a feeder filled with milk. The daily dose is from 10 to 30 grammes. As a result of this treatment the stools become less frequent and of greater consistency, regaining their normal colour and also an alkaline reaction.—(*Journal de Médecine de Paris.*)

TREATMENT OF WHOOPING-COUGH BY MORPHIA.

Triboulet, following Lesage's practice, who gave injections of morphia in spasmodic croup, had had recourse to those injections for allaying the fits of whooping-cough. The doses are from $\frac{1}{4}$ of centigramme under one year, then $\frac{1}{2}$ cg. above one year, gradually increasing the dose. Under this influence the number and the severity of the fits get noticeably smaller, with no other drawback than a little sleepiness for about two hours. These doses are repeated every day for three days, then, after an interval of three days, given again in the case of increased number of fits. Morphine has been well borne by all the children, vomiting, consequent on the coughing fits ceases, and the appetite returns. Triboulet recommends the treatment, which succeeds in simple whooping-cough, but has failed in complicated cases. Variot has raised some objections to the use of morphine in whooping-cough. A child of five years under his care died from collapse after an injection of $\frac{1}{2}$ cg. of morphia given to quiet the fits. It has been noticed that morphia behaves after the manner of atrophine, and Triboulet is of opinion that the treatment should be reserved for more serious cases.—(*La Clinique infantile.*)

SEATS OF ELECTION FOR INJECTIONS.

There are for injections of drugs (oily solutions, gray oil, etc.) four seats of election.

1. The point of Barthélmy, which is situated in the outer third of a horizontal line, running from the anterior superior iliac spine to the upper end of the groove between the buttocks. It corresponds to the outer edge of the gluteus maximus.

2. The point of Galliot, which is at the intersection of two lines, one horizontal passing two fingers' breadths above the trochanters major and

the other vertical with two fingers' breadths outside the groove between the buttocks.

3. The point of Saurinoff, this is found in the region behind the trochanters one finger's breadth behind the upper part of the trochanter major.

4. The point of Fournier, corresponding to the upper third of the buttocks.

For preference, the region of Barthélmy will be chosen. Injections should never be made into the centre of the buttock, for the needle may wound the nerves of the large vessels of the thigh.—(*Revue de Thérapeutique Méd.-chir.*)

OCCURRENCE AND PROPERTIES OF THE B. DIPHThERIEÆ IN CONVALESCENTS.

Sauerbeck states that the diphtheria bacilli can be found in patients, for weeks and months together, after the end of the illness. The persistence is however, subject to wide fluctuations; it is different in different places, and, in the same place in different patients, and in different epidemics. According to his observations, patients in hospital retain the bacilli for a rather shorter time than private patients in their own homes. No decrease in virulence, in the course of the convalescence, has been established. Besides virulent diphtheria bacilli, non-virulent diphtheria bacilli can also persist. It is difficult to make out any relation between the duration of the persistence of the bacteria, and the severity of the type of disease, although probably some parallelism exists.—(*Archiv. für Hygiene.*)

RIBES NIGRUM AND RHEUMATISM.

Huchard has been investigating the use of black-currant leaves in infusion for the treatment of chronic and subacute rheumatic affections. The infusion is taken every evening. The pharmacological examination by Dr. Chevalier showed the presence in the leaves of an essential oil, which splits up into quinic acid and a very active oxydase. It appears to act as a stimulant to the renal epithelium, promoting marked diuresis with increased elimination of incompletely oxidised nitrogen. Huchard has had an active preparation made from the fresh leaves of the black-currant, in which each gramme corresponds to one gramme of the fresh plant. The dose of this preparation is from one to three teaspoonfuls a day.—(*Journal des Praticiens.*)

MIKULICZ'S DISEASE.

Külbs had under observation a man, of 21, who was admitted into hospital for fulness in the parotid regions and marked swelling of the sub-maxillary and lachrymal glands. This was diagnosed as Mikulicz's disease. It was treated with iodide of sodium, 45 grains *per diem*, and local inunction of mercury ointment. This treatment was maintained for six weeks and greatly decreased the morbid symptoms. Six months later the patient died from poisoning by lysol. The post-mortem confirmed the diagnosis made.—(*Mittheil. a. d. Grenzgebiet d. Med. u. Chir.*)

PYOCYANASE AS A PROPHYLACTIC, AND AS A REMEDY IN CERTAIN INFECTIOUS DISEASES.

According to Emmerich, pyocyanase, which is a bacteriolytic enzyme, formed in cultures of *B. pyocyaneus*, dissolves not only the *B. pyocyaneus*, but also the *B. diphtheriæ*, *B. cholerae*, *B. typhosus*, *B. pestis*, and *B.*

anthracis, as well as streptococci, staphylococci, and gonococci. But it is able neither to kill nor to dissolve *B. tuberculosis*. Pfaundler and Zucker, following up the work of Escherich and Jehle, have tested and proved its value for prophylactic and for therapeutic purposes. Emmerich has also, in collaboration with Löw, devised experiments, the results from which prove the cure of experimental diphtheria, as well as immunisation against it, the latter being obtained by the use of a proteid immune to pyocyanase. In clinical work also, Emmerich believes that he has obtained extremely favourable results in 32 cases in the course of six years. These he attributes to the destruction and arrest of development of the *B. diphtheriæ* and of streptococci, to a combination with their toxins, to a solution of the membrane, and, finally, to a specific action of pyocyanase in assisting in the restitution of the mucous membrane. Zucker, in Pfaundler's clinic, had equally favourable results in 35 cases, using pyocyanase in inhalations of steam. Emmerich, therefore, recommends that the throat should be swabbed out freely and very frequently with pyocyanase, as an adjuvant treatment to anti-toxin injections, especially in severe and complicated cases of diphtheria, in which often appear gangrenous destruction, ichorous discharge, and general sepsis.—(*Münch. med. Wochenschr.*)

THE ACTION OF LACTIC FERMENTS IN GASTRO- INTESTINAL AFFECTIONS.

Boussard and Gautrelet find that acid-forming ferments neutralise alkaline decompositions, and hinder the free growth of proteolytic bacilli. This explains the therapeutic use, in intestinal diseases of lactic bacteria. Under their influence the stools lose their fœtor, the tongue becomes normal, the liver is relieved of congestion, and the symptoms of auto-intoxication (urticaria, eczema, migraine, etc.) disappear. Bacteriological examinations show that the normal flora of the bowel have re-appeared. Analysis of the urine shows a decrease in the relation of the sulpho-compounds to the sulphates.—(*Revue de Thérapeutique Méd.-chir.*)

TREATMENT OF TETANUS.

Lambrior reports the successful treatment of two cases of tetanus by intra-dural injections of carbolic acid. The solution employed was 1 gramme of phenol in 200 grammes of distilled and sterilised water; a solution of this strength does not alter the nervous elements. Of this solution 10 cc. were injected every two days after withdrawing an equal amount of cerebro-spinal fluid. This dose of 10 cc. daily or every two days is quite sufficient, and must not be exceeded. The two patients, submitted to this method of treatment, were suffering from the acute form of tetanus. In each case the incubation had been about seven days. High temperature ushered in the attack and the contractions quickly became general. In the first case no relief had been obtained after three days' classical treatment; the contractions only diminished after the injections of the phenol solution. In the second case no resort was made to anti-tetanic serum; only chloral and phenol were used. The result obtained was identical with that obtained in the first case. Each injection had a marked effect in lowering the temperature, and no untoward symptoms, beyond a slight headache of short duration in one case, were noticed.—(*Revue de Thérapeutique Médico-chirurg.*)

Reviews of Books.

A System of Medicine. By eminent authorities in Great Britain, the United States, and the Continent. Edited by WILLIAM OSLER, M.D., F.R.S., Regius Professor of Medicine in Oxford University, and Honorary Professor of Medicine in the Johns Hopkins University, Baltimore, assisted by THOMAS McCRAE, M.D., F.R.C.P., Associate Professor of Medicine and Clinical Therapeutics in the Johns Hopkins University Baltimore. London: The Oxford Medical Publications. Vols. III. and IV., per vol., 30s. net, or per set of 7 vols., 24s. net.

THE third volume of Professor Osler's *System of Medicine* consists of two parts, the first of which deals with infectious diseases, and is a continuation of that portion contained in volume 2. The second part contains an account of the diseases of the respiratory tract and the mediastinum. Amongst the excellent list of contributors to this volume, we would single out the names of Colonel Sir David Bruce, F.R.S., who contributes an excellent article on Malta Fever; Professor Hobart A. Hare, M.D., who writes on the diseases of the lungs; Professor W. G. MacCullum, M.D., who contributes the article dealing with the Pathology of Tuberculosis, and Professor William Osler himself, who, with Dr. John W. Churchman, is responsible for the article on Syphilis.

The fourth volume is divided into three parts, the first of which deals with the diseases of the circulatory system; the second, the diseases of the blood; and the third, with the diseases of the spleen, thymus and lymphatic glands. Dr. Richard C. Cabot writes the article dealing with the Pathology of the Blood-forming Organs and the Anæmias, while the articles on acute endocarditis, diseases of the arteries, and aneurism are from Professor Osler's pen. Dr. Alexander G. Gibson, of Oxford, contributes articles on hypertrophy of the heart, insufficiency, and dilatation of the heart, and also assists Professor Osler with the article on diseases of the valves of the heart.

With such authorities as those already mentioned, this *System of Medicine* cannot fail to take the foremost place amongst works on medicine published in the English, or in any other language.

Diseases of the Nervous System. By H. CAMPBELL THOMSON, M.D., F.R.C.P. Pp. 480. London: Cassell & Co. 10s. 6d.

As a handy compendium of neurology, this book deserves more than a passing commendation, and it should prove of great utility to those students of nervous disease, who seek for more information than is afforded by textbooks of medicine. The book is well abreast of modern advance in neurological science, though its small size necessitates a somewhat condensed style, and the avoidance of controversial discussion. A useful method of impressing the memory is the use of pictorial diagrams, showing at a glance the principal symptoms of the more important nervous diseases.

Clear and accurate as is Dr. Thomson's account of the symptomatology

of nervous diseases, there are signs of ambiguous expression, and of hurried revision in some of the anatomical descriptions. On page ten, the charts given as Head's spinal sensory areas, differ from any we have seen before in allotting the thumb and index finger to the 7th cervical root, and the 2nd and 3rd fingers to the 8th cervical; while, on p. 87, in the description of the effects of injury to the ulnar nerve, the words peripheral and proximal are interchanged from their proper places. On p. 41, there appears to be a paragraph omitted at the commencement of the description of Gudden's commissure, and, on p. 64, the 6th nerve is said to come into close proximity to the 7th nucleus, the reverse being the case; and, again, the statement, on p. 50, that a lesion of the 6th nucleus causes paralysis of the opposite internal rectus is scarcely correct, since convergence is not interfered with. The book is profusely illustrated with photographs and diagrams, most of which are excellent, and we can heartily recommend Dr. Thomson's work as the best book of its size for the study of this difficult branch of medical science.

The Nervous System of Vertebrates. By J. B. JOHNSTON, Ph.D., Professor of Zoology in West Virginia University. London: John Murray. 15s. net.

THE author gives in this volume an interesting account of the nervous system as a whole. He traces its phylogenetic history, and shows the factors which have determined the course of its evolution. Throughout the work the author deals with the brain from the point of view of function. The book is extremely well written, profusely and clearly illustrated, and will, doubtless, prove to be of great value, not only to the biologist and physiologist, but also to the neurologist.

The Principles of the Treatment of Gout. By ALFRED W. SIKES, M.D., D.Sc., F.R.C.S., M.R.C.P. Pp. 117. London: Ballantyne & Co. 3s. 6d.

WE have in this book a summary of our present knowledge relating to the treatment of gout. In these days of lengthy treatises, it is a relief to come across a book containing only the essentials of treatment, and one which is eminently adapted for practical application by the general practitioner.

Dr. Sikes has wisely not entered to any extent into the pathology of the disease, but sufficient is given to guide in the main lines of treatment. In a work of this size, we do not expect a discussion on the relative advantages and disadvantages of Spa treatment, and we are glad to note that only the essentials are given in a simple classification of waters according to their main constituents. As all medical men of experience know, the remedial effect of mineral waters in gout is first due to the action of the water in flushing the system, and secondarily to the mineral constituents.

The chapters on irregular forms of gout show that the writer has had practical experience in carrying out the details of the treatment he advocates; and this is what the general practitioner wants, since not many of us nowadays see much of the old-fashioned typical acute articular gout.

We can confidently recommend this book to the general practitioner as

being one of the most practical works on the subject which we have seen.

Operative Midwifery. By J. M. MUNRO KERR, M.B., C.M., Fellow of Faculty of Physicians and Surgeons, Glasgow; Obstetric Physician, Glasgow Maternity Hospital; Gynæcologist, Western Infirmary; President of the Glasgow Obstetrical and Gynæcological Society. 294 illustrations. Pp. 705. London: Baillière, Tindall & Cox, 21s. net.

THE writer has succeeded in placing very clearly before his readers the subject of operative midwifery.

The first part of the book is devoted to Dystocia, and its division into three headings makes it particularly clear. The author describes (1) the faults in the forces, and comments unfavourably upon the action, or rather non-action, of Quinine upon the pains, (2) faults in the fœtus, including malformation of all kinds, hydrocephalus, monsters, etc.

He rightly insists upon the importance of accurate and careful abdominal palpation, and upon at least one thorough vaginal examination, and also upon the importance, where any doubt exists as to the presentation, of giving an anæsthetic for the examination. He contends that equally good results are obtained in face presentations by judicious expectancy, as by any manipulations that the general practitioner may be able to perform in the way of turning the face into a vertex presentation, and he further goes on to say that, even though the chin may remain posterior, attempts at rotation and delivery with forceps are quite justifiable and frequently successful. He also keenly advocates the use of forceps to the after-coming head in a breech presentation rather than undue traction upon the trunk.

The third division of Dystocia deals with abnormalities in the parturient canal, this includes an excellent chapter on contracted pelvis.

The writer also describes, and discusses the operation known as vaginal Cæsarian section, and gives it as his opinion that it is most suitable in the earlier months of gestation, and that, in the later months, the abdominal route is to be preferred. The book is well illustrated, and should prove of great value to the practitioner in obstetrics, but it is too large for the student to read for examination purposes.

Clinical Lectures and Addresses on Surgery. By C. B. LOCKWOOD, F.R.C.S., Surgeon to St. Bartholomew's Hospital. London: Oxford Medical Publications. 5s.

MR. LOCKWOOD has been well advised to gather together his Clinical Lectures and Addresses into one convenient and accessible volume. Every subject with which Mr. Lockwood deals, bears the imprint of his personality, and his writings show evidence of an acute mind and independent thought. These traits are conspicuous in the volume before us, and, although it is written in the somewhat colloquial style, in which the lectures were delivered, the book will prove of interest and value to many besides the author's friends and pupils, for whose convenience it has been published. The Lectures deal with a variety of subjects, from varicose veins to carcinoma of the breast, and there is much accurate reasoning as well as much common sense in those on "Clinical Reasoning," and on "The Essentials of a Diagnosis."

No one can fail to be interested, instructed, and stimulated by a perusal of these lectures.

Notes by the Way.

Is drunkenness among women on the increase in England? And, if so, why?

There are, of course, no tabulated figures available for answering them. All that one can say for certain is that the number of female inebriates, in both the poor and the well-to-do classes, is larger than it ought to be, and that no single cause can be held responsible for all the phenomena observed. Overwork among the women of the labouring classes is one of the causes suggested; but we should not be disposed to lay great stress upon it. The women of the same class in France work harder and drink less. The much-abused grocer's license may be a factor; but only a very sanguine reformer would expect the abolition of grocers' licenses to work any remarkable change. Secret drinkers whose whisky appears in the grocer's bill as tea are probably not numerous, and would most likely be able to find wine merchants willing to supply it under the name of Evian water or Montserrat lime juice. The wine bars in confectioners' shops may also play their part in encouraging the evil, for well-dressed women with sodden faces are often to be seen there; but even these, we imagine, more often offer opportunities for indulging a bad habit than occasions for forming it.

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Causes and Remedies.

THE real crux of the difficulty is to determine the circumstances in which the women who become drunkards first take to drink.

Not until that point is settled can we attack the evil at its source. Ill-ventilated workrooms are probably responsible for a good deal; for one never feels the need of an alcoholic stimulant more intensely than immediately after quitting an atmosphere surcharged with CO₂. In a vast number of cases, too, the habit is acquired during convalescence from illness, and especially during convalescence after childbirth; and those, of course, are cases in which it is incumbent on the doctor, unless he knows and can trust his patient, to be very careful indeed. It may be desirable, and even necessary, for him to prescribe alcohol to women in this condition—a condition,

be it noted, in which the inhibitory power of the will is weak—but it is quite unnecessary and most undesirable that there should be any vagueness in his prescription as to the size or frequency of the doses. Nothing is more dangerous than to advise women in such a state to take a glass of wine or spirits “when they feel that they require it.” The consequences of doing so may be as grave in the end though not so immediately catastrophic, as would be those of advising them to take chloral under the same indefinite conditions. Many inebriates, we feel convinced, have been launched upon their course of inebriety by putting too liberal an interpretation upon loose medical advice.

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Patent Medicines and the Drug Habit. MANY interesting points arise out of the evidence given before the Departmental Committee on the law relating to inebriates.

We have no space to discuss them all; but we note with satisfaction that the Committee considered the case, not only of habitual drunkards, but also of the victims of the drug habit. It is suggested that something might be done by stiffening the law relating to the sale of poisons and absolutely prohibiting the sale of a certain number of quack medicines which owe their popularity not to their efficacy as specifics for the disorders which they are alleged to cure, but to the “comforting” effect of the morphia or cocaine contained in them. Against the hardened offender, no doubt, such restrictions would be powerless. He would not fail to circumvent his difficulties somehow, whether by copying a prescription and forging a signature or by some other means. It often happens, however, that the taste for deleterious medicaments is first acquired through the use, without medical advice, of some stimulant for the recuperation of exhausted energies or some soothing syrup for the relief of pain. If such objectionable remedies could not be obtained except under medical direction, a great many of the people who, under present conditions, come to depend on them would never do so, and, though the problem of the drug habit would still be very far from solved, it might at least be narrowed and so made more manageable.

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WHILE waiting for the long-promised Report of the Royal Commission on the Poor Laws, a contemporary pleads for a reconsideration of the functions and status of the parish doctor. Medical and hygienic science have both made great strides since such officials were first appointed; and it is coming to be realised that it is possible to utilise their services in other ways than those originally contemplated. At present they have practically nothing to do except to give gratuitous medical treatment to persons who cannot afford to pay for it. The further duty falling on them of "notifying" cases of the scheduled infectious diseases is one which they share with the general body of medical practitioners. Their position, however, and the peculiar nature of their practice really qualify them to act—to quote our contemporary—"as the advance guard of the sanitary army of the country," supplying information concerning potential as well as actual centres of disease, and so preparing the way for all manner of precautionary hygienic measures. A step was taken in the right direction when Mr. Burns issued his recent order requiring medical officers under the Poor Law to notify cases of pulmonary phthisis to medical officers of health; but this is only a small fraction of what might be done if the service were put on a more satisfactory basis, and if the parish, doctors were made responsible, not to Boards of Guardians whose principal care is to protect the public purse, and who, as a general rule, can make neither head nor tail of a scientific report, nor found any intelligent policy upon it, but to some central authority capable of understanding it, and empowered to act. The matter is one which ought to receive ample consideration when at last the time for reviewing and revising the Poor Law comes.

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THE trustees of the London Hospital have received a benefaction which will be the more welcome because of the latitude left to the beneficiaries in dealing with it. An anonymous donor has placed £20,000 in their hands without labelling, or ear-marking, his gift in any way, except to stipulate that the money shall be invested and that the income shall be expended, not in routine teaching, but in the advance-

ment of medical research and the promotion of higher education in medicine. It is not too much to say that the value of the gift is doubled by this absence of strict provisions as to its application. Nothing is more common than for donors to defeat the ends of charity by too precise directions; nothing, on the other hand, is more difficult than for a donor to foresee to what uses his money may most profitably be put in years to come. The wisest course, though the rarest, is first to choose the administrators of the fund with discretion, and then to leave the details to them. In this particular case it is most wisely provided that, though the three administrators selected are all associated with the London Hospital, and though the research work is to be carried on there, the benefits of the gift are not to be confined to London Hospital men, but may be bestowed upon any qualified men anywhere in the Empire who show aptitude for original research and are willing to conform to the prescribed conditions. The donor recognises, that is to say,—what donors so often fail to recognise—that research is not a parochial affair, and that it is more important to advance science than to benefit particular scientific institutions.

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THE present financial position of the London Hospital Finance. hospitals raises points which merit consideration. A protest is necessary against the tendency to build new hospitals, without making any adequate provision for their maintenance, with the result that the life of the secretary is a perpetual struggle to make both ends meet, and that it is necessary to rely upon legacies to meet the difference between assured income and expenditure—a difference which amounted in 1907 to no less than £250,000. Decidedly, it is more important to strengthen the financial position of the hospitals already existing—in many of which beds are now lying empty, not for lack of patients, but for lack of funds—than to erect new ones in outlying districts to compete for the support of the benevolent. Where additional provision is required in the suburbs, it would suffice to construct first-aid premises with a couple of wards, in telephonic communication with the nearest general hospital. More use might also be made of the hospital-trained district nurses, so as to lessen the number of attendances at the hospitals, and free valuable beds by making earlier

discharges possible. Hospital finance is at present in a state which makes business-like management very requisite.

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Hospital Milk Supply.

WE have received a copy of the Report of the Committee recently appointed to consider what action, if any, should be taken in the matter of the milk supply of the Liverpool Voluntary Hospitals, "with special reference to tubercular infection," and a summary of the discussion preceding its adoption. It is assumed, both in the debate and in the Report,—most rightly and reasonably as we have often urged—that bovine tuberculosis is in this way transmissible to human patients; and the various means by which the milk of cows may be contaminated are thus lucidly tabulated by Professor Sir Rupert Boyce:—

1. The cow may have a tuberculous udder.
2. There may be no lesion of the udder, but a tubercular focus somewhere in the body of the animal, with practically identical results so far as the milk is concerned.
3. The milk may be infected from the dust of the shippin and the hands of the milker,—a very frequent source of contamination because:—

(a) It has been proved that a cow suffering from tuberculosis can excrete bacilli in the urine and fæces.

(b) Dung contamination of milk is probably exceedingly common, and so, with the dung, bacilli are introduced into the milk.

"Obviously, therefore," Sir Rupert Boyce concludes, "the remedy is rigid supervision and sanitation, and the total elimination from the shippin of any animal reacting to tuberculin."

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Practical Suggestions.

THE Report itself points out some of the evils which may result when the milk supply is either contaminated or deficient in quality.

It is a factor in the causation not only of tuberculosis, but also of malnutrition, diarrhœa, rickets, and other disorders. Hence the importance of securing, especially for hospital use, a pure supply "obtained from healthy cows kept clean, under good hygienic conditions and properly fed." The conditions suggested by the Committee for this purpose are as follows:—

1. Systematic inspection of the farm.
2. Periodical analysis of the milk for fats, solids and

adulteration.

3. Bacteriological examination at intervals for the usual infective organisms, more especially tubercle, and for other bacterial contamination.

4. Periodical application of the tuberculin test.

5. The farm and accessories to be properly equipped and kept up to an approved standard of hygienic efficiency.

6. The use of special milk cans or "churns" for transport, of convenient size, rain and dust proof, and capable of being readily sealed. These to be registered, numbered, and stamped on the outside with tare weight.

A further valuable suggestion is that there should be a conference of representatives of the Governors and Medical Boards of the various voluntary hospitals, with a view to concerted action in the matter.

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The Royal
Commission.

SOME further light is thrown concurrently on the same subject by the third interim Report of the Royal Commission on Tuberculosis. The question more particularly investigated by the Commissioners is "the danger, if any, attaching to the milk of tuberculous cows in which the udder presents no evidence of disease." A number of experiments were made on cows fulfilling the necessary conditions—cows, that is to say, in which the presence of tuberculosis could be detected only by means of the injection of tuberculin. It was found that the milk contained tubercle bacilli whether it was obtained in the ordinary way or was withdrawn from the teat by means of a sterilised catheter; and the conclusion inferred was that "the presence of tubercle bacilli in the milk of cows clinically recognisable as tuberculous confirms the opinion which we expressed in our second interim report, that the milk of such cows must be considered dangerous for human beings." It was further found that the fæces of such cows were virulently infected; and this discovery clearly warranted the supplementary conclusion that "the presence of tuberculous cows in company with healthy cows in the cowshed is dangerous, as some of the tubercle bacilli which escape from their bodies in the excrement are almost certain to find their way into the milk."

Practical Notes.

HEGAR'S SIGN IN THE DIAGNOSIS OF PREGNANCY.—The diagnosis of pregnancy in the early months is made from a consideration of two sets of factors, namely, subjective symptoms of which the patient herself complains, such as cessation of menstruation, abnormal sensations in the breasts, etc., and objective phenomena discovered by physical examination. Of the latter, one of the most valuable is the phenomenon known as Hegar's sign. This consists in softening of the lower uterine segment, which comprises that part of the body of the uterus which is situated just above the level of the internal os. It is elicited by making a careful pre-renal examination of the uterus, with the patient in the lithotomy position. The cervix is felt as a somewhat hard mass, the tip of which is softened. Just above this is the softened lower uterine segment, through which the two hands may be made almost to meet, whilst above this again is felt the body of the uterus, which has not undergone any softening. The body of the uterus also seems extremely mobile, because of the lack of resistance in the softened lower uterine segment. Although all the symptoms produced by pregnancy in the early months before the appearance of the foetal heart are all merely presumptive ones, we believe that Hegar's sign constitutes the most certain of all the presumptive signs of pregnancy.

AGGLUTINATION OF THE LABIA.—Adhesion of the labia minora, *conglutinatio nymphæ*, is a condition in which the edges of the opposing labia minora become adherent to each other, forming a second fold across the vulval orifice on a lower level than the hymen. Occasionally the labia majora may also become united.

The condition is not infrequently observed in infants, and is also met with in childhood and senility, but it is almost unknown in the married state, and in those who are bearing children.

Labial adhesions may be either congenital or acquired, the latter being the more common. Irritating discharges and uncleanliness are the most usual causes. The labia may merely

stick together by accumulated abnormal secretion, whilst in some cases, owing to destruction of the protective superficial epithelium, firm fibrous union may occur. In infancy and childhood the symptoms are usually slight, consisting of irritation and discomfort, causing the child to rub or manipulate the parts, which causes the mother to notice the condition. Masturbation may be induced by this condition. The abnormal direction of the stream of urine may also direct attention to it. In adults the menstrual discharge may be retained by the membrane, or it may escape with difficulty. Sexual intercourse may also be interfered with, and may even take place through the urethra. Should pregnancy occur, the adhesions may form an obstruction to the delivery of the child.

When the condition has been recognised, the treatment is simple. In infants, in whom the labia are merely stuck together by secretions, the labia are readily separated by inserting a probe beneath the line of union, or they may be forcibly separated with the thumbs, and a pledget of lint, covered with carbolated vaseline, is placed between the labia, kept in place by a T-bandage and changed daily for a week.

Where the adhesions have become organised into fibrous tissue, incision must be performed. A grooved director is passed through the opening below the urethra, and the labia are then divided with a scalpel along the line of union. If no opening is present below the urethral orifice, a sound is passed into the urethra, and this structure is held out of harm's way, whilst the parts are put upon the stretch with the thumb and index finger, and an incision is then made along the middle line between the adherent labia. The after treatment consists in the prevention of re-adhesion of the labia by the same means as were employed after forcible separation of the labia.

ASPHYXIA NEONATORUM.—Asphyxia in the new-born child is the condition which results from insufficient oxygenation of the blood. At the birth of the child, placental respiration ceases, and carbon dioxide accumulates in the blood. In small quantities this substance stimulates the respiratory centre in the medulla oblongata, whilst larger quantities depress and finally paralyse it. A further stimulus to respiration is produced by the sudden change in the

environment of the child, which is rapidly expelled from a liquid medium, at a temperature of blood heat, to the cool surroundings of the external air.

The causes of asphyxia neonatorum may be either of intra-uterine or extra-uterine origin. Intra-uterine causes include foetal inspiration, especially common in breech cases, any interference with the placental circulation, as excessive and prolonged uterine contractions, premature detachment of the placenta, prolapse, compression, coiling or knotting of the umbilical cord, or disease of the umbilical vessels, as syphilitic periphlebitis, prolonged pressure on the foetal brain by forceps or pelvic walls, leading to intra-cranial hæmorrhages, or paralysis of the brain centres, anomalies or diseases of the foetal respiratory and circulatory organs, and finally severe systemic diseases of the mother.

Extra-uterine causes include interference with the access of air to the respiratory passages, as by unruptured membranes, a caul, maternal discharges, placing the infant after birth in a position unfavourable for respiration, and precipitate labour.

Two varieties of this condition are recognised, namely, *asphyxia livida*, or blue asphyxia, and *asphyxia pallida*, or white asphyxia.

In *asphyxia livida*, the skin is blue and congested, the muscles are firm and flexed, the heart beats forcibly, and the reflexes are preserved. In this variety the prognosis is favourable, for the child can generally be successfully resuscitated.

In *asphyxia pallida*, shock is superadded to asphyxia, the skin is cold and white, the muscles are flaccid and flabby, the heart beats feebly and slowly, and the reflexes are abolished. The prognosis is much less favourable in this variety, and prolonged efforts at resuscitation may fail.

The treatment may be prophylactic or curative. The prophylactic measures aim at preventing the asphyxia by removal of all possible cases during labour. The curative treatment comprises the various methods of resuscitation. Mucus and discharges are first removed from the mouth and pharynx by cleansing with the finger, so that there may be no impediment to the free ingress and egress of air into the chest. This should be done in both varieties of asphyxia, but the remainder of the treatment differs in the two varieties.

In *asphyxia pallida*, the child should be gently placed in a

warm bath, in which artificial respiration by Silvester's method should be performed, and the lips should be rubbed with brandy. Vigorous methods which would increase the already severe shock are here contra-indicated.

In asphyxia pallida, the buttocks may be briskly smacked, the back and chest vigorously rubbed, and alternate warm and cold baths may be given, or cold water may be poured from a height on the chest whilst the child is immersed in a hot bath. Artificial respiration, by one or more of the several methods in use, viz., Silvester's, Marshall Hall's, Byrd's, Schäfer's or Schultze's. The last named, also known as Schultze's swinging, is one of the best, and is exclusively used for asphyxia neonatorum. The child is wrapped in a towel to protect it from being chilled, and from slipping out of the operator's hands. It is then grasped from behind the shoulders, the scapulæ resting on the operator's palms, whilst the index fingers pass under the axillæ, and the thumbs over the shoulders. The child is then swung between the operator's knees and over his shoulder, the manipulation being repeated from 15 to 20 times per second. Direct mouth-to-mouth insufflation, as well as catheterisation of the larynx with a soft catheter, and direct insufflation of the lungs have also been tried with success, whilst tracheotomy and catheterisation through the wound can only be required as a last resort in very exceptional cases.

Artificial respiration is not without danger in the new-born child, as the following list of injuries, which have resulted from its performance, testifies:—Cerebral hæmorrhage; injury to the spinal cord; fracture of the clavicle with puncture of the lung; injuries to the trachea and larynx; hæmorrhagic effusions into lungs and pleuræ; rupture of the air vesicles.

Lastly, a child, deeply asphyxiated and revived with difficulty, will often die within the next couple of days, from cardiac or respiratory failure, or as the result of intracranial mischief. Such children should, therefore, be carefully watched and nursed, being swathed in cotton-wool and surrounded by hot-water bottles, and a wise proceeding in such cases consists in the routine administration of five drops of brandy and one drop of tincture of digitalis every two to four hours for the first two or three days of life.

Preparations and Inventions.

GLIDINE. IODOGLIDINE. BROMOGLIDINE.

(Messrs. Menley & James, Limited, Menley House,
Farringdon Road, E.C.)

Glidine is introduced to the medical profession in this country from Germany and Austria, where it is extensively employed in every-day practice. It is a vegetable protein food, prepared wholly from wheat. Its composition is

Albumin	-	-	- 95.69 per cent.
Lecithin	-	-	- .87 „
Carbohydrate	-	-	- 2.72 „
Ash	-	-	- .72 „

Physiological experiment and clinical investigation have shown that it is readily digested, and has a very high food value, so that it is specially indicated in conditions of physical debility or nerve exhaustion, and whenever it is desirable to raise the nutritive value of any food. Being a colourless and tasteless powder, it may be added to almost any food, when ready for use, but preferably should not be cooked with it.

Iodoglidine and Bromoglidine are very stable combinations of Iodine and Bromine respectively with Glidine. The slow dissociation of the Iodine and Bromine, and the consequently retarded absorption, are a safeguard against the gastro-intestinal irritation and the general toxic by-effects, so frequently set up by the alkaline Iodides and Bromides. Depression also is avoided, as an equal therapeutic effect is obtained by a much smaller dose. Both Iodoglidine and Bromoglidine are dispensed in tablet form in glass phials.

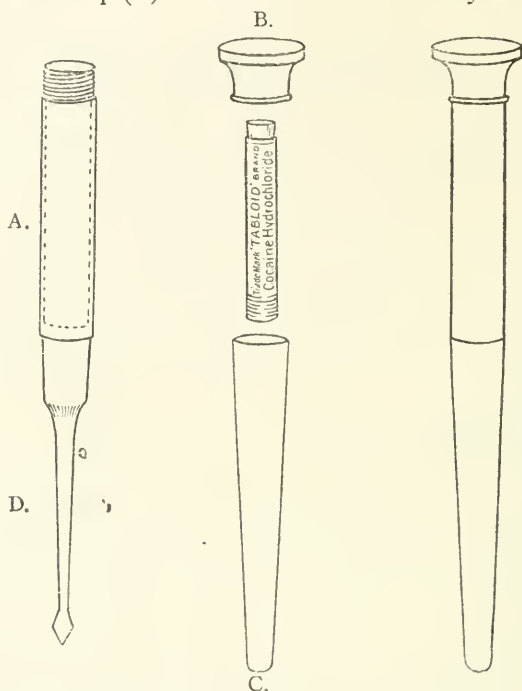
Samples and literature are sent, on application, free to all members of the medical profession.

AN OPHTHALMIC VADE-MECUM.

(Messrs. Burroughs Wellcome & Co., London, E.C.)

This useful little instrument, designed by Dr. Edgar Whitaker, consists of a small hollow barrel (A) on the top of

which screws a cap (B). This barrel has a cavity which exactly



receives a tube of ophthalmic tabloid cocaine. The lower portion of the barrel is graded off into a fine but firm spatula with a pointed end (D) for the removal of foreign bodies from the cornea. There is a cover (C) which prevents injury to this part of the instrument. The whole instrument is about the size of an ordinary silver pencil-case—viz., $3\frac{1}{4}$ inches long—and therefore can be readily carried in the breast pocket. We consider the little instrument, which is made in silver and metal, a very useful one, for it fills a long-felt want.

ELECTRICAL APPLIANCES.

(Messrs. F. Davidson & Co., 29 Great Portland Street, London, W.)

These appliances are supplied in a very neat little mahogany case and include two batteries, a number of cauteries, and illuminating apparatus. There are also instruments for ophthalmoscopy and examination of the ear, nose, and throat, and lighting tubes, which may be used for the trans-illumination of the sclera, antrum, and the frontal sinuses. The whole apparatus is put together in an ingenious manner, and is in no way bulky or heavy. Hence it will be extremely useful in every-day practice.

THE PRACTITIONER.

APRIL, 1909.

A NOTE ON LOCAL ANÆSTHESIA IN REGARD TO THE CAUSATION OF "IDIOPATHIC" PARALYSIS AND DILATATION OF THE URINARY BLADDER.

WITH REMARKS ON FUNCTIONAL ANÆSTHESIA OF
MUCOUS MEMBRANES, AS FOUND IN CASES OF
UNIVERSAL CUTANEOUS ANÆSTHESIA.

By F. PARKES WEBER, M.D., F.R.C.P.,

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FROM time to time patients are observed suffering from paralysis and dilatation of the urinary bladder, but with no other sign of any disease of the nervous system. Some of these subsequently develop undoubted signs of tabes dorsalis, or general paralysis. I have recently had a man, aged 57 years, under my care at the German Hospital, whose urinary bladder would become enormously distended (so as to simulate the presence of ascites) unless a catheter was regularly passed. The history was that two years ago his urine had had to be temporarily drawn off with a catheter, but then he seemed to get better. During the last year he had been feeling weaker, and his feet were often swollen. He had sometimes suffered from "rheumatism." In the hospital no signs of tabes dorsalis or other disease of the nervous system could be made out, excepting the bladder trouble. The knee-jerks, Achilles tendon-jerks, and pupil reflexes were natural, and no cutaneous anæsthesia was detected. No morbid changes were found by ophthalmoscopic examination. The daily amount of urine was 2,500 c.cm. or more. The urine was of specific gravity, 1,010 to 1,019, and free from sugar and albumen, though a few tube-casts were present. There was no enlargement of the prostate gland. There was no cystitis. A notable point was the patient's complete want of knowledge (so far as he could judge by his sensations) as to whether his bladder was full or not. In this one respect there seemed to be real anæsthesia. He

felt no discomfort however much his bladder was distended. When a catheter was passed the urine came away readily.

What was the explanation of this retention of urine? Had his vesical sensation become blunted owing to habitual over-distension of the organ, or was the anæsthesia, or hypo-æsthesia, a causal factor in the production of the retention? We know that in old people who hold their urine too long, sensation in regard to fulness of the bladder becomes dulled, and the bladder tends to become dilated from the neglect. Similarly, in persons with chronic constipation, and in those who habitually disregard the calls of nature, local sensation (so far as feeling the call to defæcate is concerned) becomes diminished or almost lost, and the sigmoid flexure and colon tend to become dilated. So also in persons who habitually overload their stomachs, the sensation of gastric fulness becomes gradually less readily felt, and the organ tends to become dilated. In the present case, however, it seemed possible that a local hypo-æsthesia or anæsthesia (occurring as an early symptom of nervous disease) was an important factor in the retention of urine and vesical dilatation.

In this connection it is interesting to note that S. G. Shattock and T. G. Brodie found that in cats the result of rendering the interior of the bladder anæsthetic by cocaine was to abolish micturition, so long as the local effect of the drug lasted.¹ Shattock likewise refers to the subject of hysterical hypo-æsthesia and anæsthesia of mucous membranes, and the question may be asked, as it has often been asked before, to what extent are hysterical retention of urine and constipation dependent on hysterical hypo-æsthesia or anæsthesia of the urinary bladder and rectum? Briquet² and later writers have recorded extreme examples of functional (hysterical) anæsthesia of the various mucous membranes. That functional anæsthesia of mucous membranes may occasionally reach an extreme degree, I had myself the opportunity of observing, in 1897, in the case of a well-built, muscular young man, aged 21 years,³ under my care as an in-patient at the German Hospital. He had cutaneous anæsthesia and analgesia over very nearly the whole of his body and limbs (a very much

¹ See S. G. Shattock, on "Idiopathic Dilatation of the Bladder," *Proceedings of the Royal Society of Medicine, Pathological Section*, 1909, Vol. II., p. 99.

² P. Briquet: *Traité de l'Hystérie*, Paris, 1859, p. 289.

³ See F. P. Weber, *St. Bart's Hosp. Reports*, London 1898, Vol. 34, p. 313.

rarer condition than the well-known hysterical hemianæsthesia), but in addition there was anæsthesia of the mouth, not merely anæsthesia of the pharynx and fauces such as is so commonly observed in hysterical cases. At one period of the illness, possibly even tooth-extraction would have been painless. After a time, however, he gradually but completely recovered sensation, the anæsthesia disappearing last from the limbs. When the anæsthesia was limited to the limbs, it was noted that the proximal limit of the anæsthetic areas was sharply defined as by the upper border of a stocking, a condition (stocking-shaped areas of anæsthesia), as pointed out by Charcot and others, almost pathognomonic of hysterical anæsthesia.

In 1878, A. Strümpell¹ recorded the afterwards much-quoted case of a shoemaker's apprentice, aged 15 years, with almost complete anæsthesia. In his case the universal cutaneous anæsthesia was certainly accompanied by loss of sensation in the mucous membrane of the alimentary canal, for, it is stated, that the passage of fæces could not be felt, though they were heard as they dropped in the closet; food could not be felt in the mouth, neither was the sensation of hunger normally present. The patient could still see and hear. Sensation began gradually to return after nearly half a year.

H. von Ziemssen,² in 1891, recorded another remarkable case of functional anæsthesia, which commenced after an attack of typhoid fever, and involved the mucous membranes extensively as well as the whole of the skin. The patient was a young man, aged 22½ years, the earlier history of whose case had already been described by Dr. Max Heyne.³ In addition to universal cutaneous anæsthesia, there was loss of sensation in the mouth, tongue, and pharynx, in the nasal passages and external ears, and in the œsophagus, urethra, and rectum. No sense of smell was left, and no feeling of hunger was experienced, but the patient could see and hear. As in the other cases, sensation gradually returned, though the psychical condition remained abnormal. Ziemssen also gave an account of another patient, a woman, aged 58 years, with general cutaneous anæsthesia and loss of smell and

¹ A. Strümpell, *Deut. Archiv für klin. Med.*, Leipzig, 1878, Vol. 22, p. 321.

² H. von Ziemssen, *Deut. Archiv für klin. Med.*, Leipzig, 1891, Vol. 47, p. 89.

³ Max Heyne, *ibid.*, Vol. 47, p. 75.

taste. Like the other patients she could still see and hear. The case of this woman, however, was complicated by severe inanition, and death occurred after the illness had lasted about 14 weeks. The post-mortem examination showed inanition and a senile type of atrophy, but nothing else of importance towards explaining the anæsthesia.

In L. E. Bregman's recent case¹ of a woman, aged 26 years, with recurrent or periodical functional attacks of universal anæsthesia of the skin, there was likewise complete loss of sensation in the pharynx, larynx, stomach, rectum, and urinary bladder. The patient, though she could hear and see, could not smell or taste anything. She had no sense of hunger or of fulness after meals, and felt no call to pass urine or fæces.

Bregman also refers to cases of more or less total anæsthesia described by Winter (1882, the anæsthesia was not quite complete), Ballet (following trauma) and Raymond (two cases, one of them following typhoid fever, as did Heyne and Ziemssen's case, to which I have already referred to). Strümpell, in his case, found that he could induce sleep by shutting off light and sound, and this so-called "Strümpell's experiment" also succeeded in bringing on sleep in subsequent similar cases; that is to say, when the patients had their eyes covered, and their ears stopped up with cotton-wool, they would fall asleep in the course of a few minutes. Strümpell's first suggested explanation of this phenomenon was that sleep was caused by removing the stimuli of seeing objects and hearing sounds in patients, whose anæsthesia deprived them of the other ordinary stimuli. But the sleep induced by Strümpell's method in such cases is now supposed to be a simple result of hypnotic suggestion.

The preservation of "subconscious sensibility" in cases of hysterical anæsthesia has been specially studied by Pierre Janet,² and may explain many of the apparently contradictory results obtained from clinical investigations in cases of functional anæsthesia.

¹ L. E. Bregman: *Neurolog. Centralblatt*, Leipzig, 1908, Vol. 27, p. 498.

² See, for instance, Pierre Janet's recent book, *The Major Symptoms of Hysteria*, New York, 1907, p. 170, etc., where he refers to the case of a young woman ("Lucie"), aged 22 years, who had hysterical attacks accompanied by universal anæsthesia.

Functional (hysterical) anæsthesia of the urinary bladder and rectum seems not necessarily to give rise to retention of urine and constipation (even if no actual call to pass urine or defæcate is felt), probably, I suppose, because "subconscious sensibility" is not lost. At all events, functional retention of urine and constipation are not always due to hysterical anæsthesia of the bladder and rectum respectively, even when they occur in hysterical subjects. It seems to me that two types of anæsthesia of the urinary bladder may occur:—(1) A type due to organic disease of the nervous system (of which, in fact, it may for a time be the only manifestation), which gives rise to retention of urine, and thus tends to gradually produce vesical dilatation, unless the organ is regularly emptied at proper intervals by the use of the catheter; (2) a type due to functional nervous disease, which sometimes occurs, associated with hysterical universal anæsthesia of the skin, but sometimes also with more limited cutaneous anæsthesia. This (functional) type of vesical anæsthesia appears not to give rise to (though it may, of course, be accompanied by) hysterical retention of urine. The fact that it does not induce grave bladder trouble may be compared with the fact that patients suffering from hysterical cutaneous anæsthesia, rarely injure themselves by accident, owing to their loss of cutaneous sensation,¹ and may be also compared with the equally well-known fact that patients, with extreme hysterical contraction of both fields of vision, easily and apparently without any effort, avoid obstacles at their sides.

Besides the two types of vesical anæsthesia mentioned above, there is a hypo-æsthesia or blunting of sensation, which may occur in some individuals who, for some reason or other, do not empty their bladders often enough.

Further observation is certainly required in regard to the effects (if any) of hysterical anæsthesia of mucous membranes on the motor and other functions of the organs involved. The conclusions suggested in this paper may, of course, have to be altered or modified.

¹ Analgesia due to organic nervous diseases, such as syringomyelia, may on the other hand, as is well known, lead to accidental burns and other injuries in the analgesic parts.

THE TREATMENT OF EXTROVERSION OF THE BLADDER BY IMPLANTATION OF THE URETERS INTO THE RECTUM.¹

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[With Plate IV.]

THE congenital abnormality, known as extroversion of the bladder, has for many years provided an extensive field for the exercise of surgical ingenuity. The cause is as yet unexplained. It has been considered due to defective development; not solely of the urogenital apparatus, but to a failure of junction between the lateral segments of that portion of the somatopleure, whose duty it is to furnish the anterior surface of the body, which extends from the umbilicus to the floor of the urethra, together with a cleft condition anteriorly of the allantoic vesicle. According to Keith, "Certain chambers in the embryo, such as the neural canal and pericardium, are liable to a dropsy and rupture. Were the cloaca of the embryo to be ruptured along its ventral wall the condition of ectopia would be produced." Others attribute the vesical cleft to bursting of the overfull bladder. This theory rests upon the dilatation of the ureters and renal pelvis, so often found associated with vesical cleft. But Kauffman found that the secretion of urine does not begin until the end of the second month, long before which time the symphysis is formed. He, therefore, supposes that the symphysis becomes separated again in those cases of vesical cleft in which it is found open.

The usual deformity we have to deal with is that in which the anterior wall of the bladder and roof of the urethra and the parts of the abdominal wall in front of these are absent; the trigone floor of the urethra, and posterior wall of the bladder are continuous, and flush with the abdominal wall. In addition, the bladder-wall is protruded by a ventral hernia; double inguinal herniæ are also present. Fig. 1. The complete cleft is commoner in the male than

¹ A communication read before the Dublin Biological Club.

in the female ; when it occurs in the latter, the urethra is wanting and the clitoris, when present, is cleft. Even the internal pelvic organs, the uterus and its appendages, show effects of the faulty union of the two lateral halves, and there may be a double uterus, each with its own vagina.

The large number of operations devised and carried out, with varying degrees of success, is a proof that a satisfactory method of dealing with this distressing condition has not been devised. That heroic measures are considered justifiable may be indicated by the method suggested by Reginald Harrison, namely, entire ablation of one kidney, the ureter of the remaining one being brought out in the loin. A loop of ileum has been excised in order to make a bladder cavity, the continuity of the intestine being restored by an end-to-end anastomosis.

The operations that have been suggested may be divided into three groups :—

1. Plastic operations.

2. Those which have for their object the union of separated edges.

3. Operations intended to divert the urinary stream.

Most plastic operations have for their object the creation of a vesical cavity, and perhaps a sphincter, by means of one or more flaps. The best result obtained by such a method provides only a small cavity, too small to be of use as a urinary bladder, and without a functioning sphincter. Calculus deposits take place in this little bladder, and the patient's condition is little better than before.

Some surgeons, as Trendelenburg, have attempted, by dividing both sacral synchondroses, to close the cleft in the pubes, and thus allow the cleft in the bladder to be sutured. Some cases thus treated survived the operation, but were little better afterwards than those treated by the older and less dangerous flap operations. Simon, in 1851, directed the urine into the rectum, basing the operation upon the fact that in many animals there is a cloaca, that serves as a common receptacle for urine and fæces, and that, further, the ureters are sometimes found at birth to open into the rectum, and that patients, with a fistula between the bladder and rectum, learn in time to control, more or less perfectly, the escape of urine from the anus. Simon's patient, and one operated on by Lloyd, died of

peritonitis. Thiersch was the first to establish permanent connection between the bladder and rectum, in 1881. During the next ten years, numerous experiments on animals seemed to show that the mucous membrane of the rectum was capable of withstanding the constant irritation of urine, and that the sphincter of the rectum would prevent its escape more or less perfectly. But the fear of ureteritis and pyonephrosis kept surgeons from repeating Simon's operation, until 1892. In that year, Maydl excised the everted mucous membrane of a man, æt. 20, and, after opening the peritoneal cavity, implanted in the sigmoid flexure an elliptical piece of the base of the bladder containing the mouths of the ureters. He hoped to avoid infection of the ureters by preserving intact their mouths with their sphincters, and also by implanting them in a portion of the intestine, which is free from fluid, and does not constantly contain fæcal matter. This patient recovered from the operation, and passed water every four to eight hours. Maydl's operation has now been carried out several times with varying degrees of success, but it seems that peritonitis must always be a grave risk, and kinking of the ureters has led to serious trouble.

The next great advance was made, in the year 1899, by Lendon, of Adelaide, who by an extraperitoneal operation, implanted the ureters, with a rosette of mucous membrane round each ureteral orifice, into the rectum through two small openings made by a sinus forceps. One ureter remained successfully implanted, but the other slipped out, and subsequent operations failed to fix it there; so it was implanted into the sigmoid flexure, as in Maydl's operation, and the subsequent result was a brilliant success, the patient being alive six years later, and having perfect control. Two months after Lendon's operation, Peters, of Toronto, successfully implanted, by an extraperitoneal operation, both ureters into the rectum in a boy, æt. $5\frac{1}{2}$ years. This was completely successful, the patient being in perfect health $2\frac{1}{2}$ years later.

This method of treating extroversion of the bladder appears the safest to perform, and to give excellent results; the only serious risk is that of ascending kidney sepsis, two cases out of eight having terminated fatally this way, one five days after operation; the other, two months afterwards.

As the remaining cases were entirely successful, I decided to adopt this procedure in the following case, which is that of a

US¹₂

PLATE IV.



Fig. 1.—*Photograph of the child before operation. Note the protrusion of the bladder which obscures the trigone and urethra. The bladder mucous membrane is undergoing papillomatous and cystic changes. The rounded projection in the centre of the bladder is a mucous cyst, numerous smaller ones were found on section. The scrotum is well marked, both testicles are fully descended. There is a well-marked umbilicus with a slight hernial protrusion. The inguinal hernia can be seen, best marked on the left side.*



Fig. 2.—*Photograph taken at the commencement of the operation. The prepuce is pulled on to expose the orifices of the ureters which have been catheterised. The open urethra and split glans penis can readily be seen.*



Fig. 3.—*Photograph taken three months after the operation. There is no bulging into the old bladder area. The inguinal hernia appear larger than in Fig. 1 as the child had been walking about. They reduce when he lies down, and cause no inconvenience.*

boy, aged five, upon whom I performed this operation last July.

In view of the risk of kidney sepsis after the operation, I determined to take all steps possible to avoid this by attempting to get the boy's alimentary canal as surgically clean as possible. The treatment consisted in well purging with calomel; 5 grs. of salol were given three times a day for a week. Five hours before the operation, the lower bowel was emptied by an enema; opium was then given to check peristalsis. When the child was on the table, the rectum was washed out with cyllin. In addition to the risk of kidney sepsis, there was a considerable risk of severe infection of the recto-vesical space. I had thought of getting the child's opsonic index raised for some of the rectal flora, and, curiously enough, there was an entire absence of any infection of the wound from the rectum.

Operation.—The steps of the operation were briefly as follows:—Both ureters having been catheterised (Fig. 2), a mesial incision was made through the trigone, until the bladder-wall was completely cut through. The ureters were then identified, and an incision carried round each ureteral orifice through the entire thickness of the bladder-wall, thus leaving a large rosette of mucous membrane and bladder surrounding each ureteral orifice. The catheters were then firmly fixed in the ureters by purse-string sutures, passed only through the edges of the mucous membrane in the rosettes, and thus injury to the orifices of the ureters was avoided. The ureters were then dissected free for a couple of inches upwards, and the anterior surface of the rectum exposed, the peritoneum being now seen for the first time. There was some difficulty in lifting the recto-vesical fold upwards, as it was rather adherent to the rectum. (It is, of course, advisable to introduce the ureters into the rectum as high as is possible without opening the peritoneal cavity.) A curved Kocher forceps was next introduced through the anus, and forced through the lateral wall of the rectum at a place convenient to the loose ureter on the right side; the end of the catheter was caught by the forceps and the catheter withdrawn through the anus, the ureter with its rosette of bladder-wall easily followed through the small opening into the rectum. The left ureter was similarly dealt with. The catheters were then removed, for leaving them,

as has been sometimes done to fix the ureters in the rectum, must greatly increase the risk of kidney sepsis. I did not stitch the rosette of bladder to the rectal mucous membrane, for it appeared that fixing the ends might increase the risk of kinking of the ureters; this is a complication that has followed this operation several times, but, if the ureters are left quite loose, even in a slightly faulty position, they could, I think, during the first few hours after operation, unkink themselves, and settle themselves in the most comfortable position. With sufficiently large rosettes there should be no risk of the ureters slipping out of the rectum. The anterior wound was then plugged loosely, and the child returned to bed.

After-history.—There was no shock; pain was absent; and there was an entire absence of any infection from the rectal wounds, the temperature never rising above 99° F. Two weeks after the ureters were implanted in the rectum, I dissected away the remainder of the bladder, which by this time had grown continuous again with the urethral mucous membrane. The hernia into the bladder was dealt with at the same time, and the urethra was closed.

The second operation proved more troublesome and took considerably longer than the former. The entire wound healed per primam, with the exception of the end of the glans penis. This, however, causes him no inconvenience. His present condition is seen in Fig. 3. The control of urine at first was rather disappointing: this was, I think, to a large extent, due to the habits of the child, for before the operation, as he was always wet with urine, he was allowed to evacuate his bowels whenever he felt inclined, regardless of time or place. He left hospital and returned home five weeks after the ureters were implanted into the rectum. Three months later, the child was again admitted to hospital, to see if any further operative measures were required. His power of retaining urine had greatly improved, and when treated in the same way as the other occupants of the children's ward, he kept quite dry by day and night, with the exception of an occasional "accident," being able to retain urine for various periods up to 3½ hours. His general health is splendid, and the urine produces no irritation of the rectum or anal region.

THE INCREASED DEATH-RATE FROM DIABETES, AND THE POSSIBILITY OF PREVENTING THE DISEASE, OR OF POSTPONING ITS ONSET.

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I. DEATH-RATE FROM DIABETES.—Statistics show that the death-rate from diabetes mellitus in England and Wales is steadily increasing. From the annual reports of the Registrar-General we see that the death-rate from diabetes mellitus in England and Wales, in 1866, was 32 per million living; in 1886, 59; in 1906, it was 97. Taking the records for the last 20 years, we find that, in 1887, there were registered 1,750 deaths from diabetes mellitus; in 1906, 3,342. The death-rate from the disease per million living increased from 63, in 1887, to 97, in 1906. The increase was seen in both males and females. In 1887, the death-rate from the disease in males was 75 per million living; in 1906, it was 104 per million. In females, the death-rate from the disease per million living was 51, in 1887, 90, in 1906.

In the *Supplement to the 65th Annual Report of the Registrar-General*, published in 1907, Dr. J. Tatham draws attention to the increased death-rate from diabetes mellitus during the decennium last ended, 1891 to 1900. During this period, the disease was fatal in the proportion of 75 per million living of both sexes, and at all ages. The records show that the death-rate from diabetes has rapidly increased during the last 50 years. The death-rate from diabetes mellitus per million living for four periods of ten years, from 1861 to 1900, is shown in the following table (given by Dr. Tatham):—

—	Males and Females.	Males.	Females.
1861-70 - - -	31	42	21
1871-80 - - -	39	51	28
1881-90 - - -	58	71	46
1891-1900 - - -	75	86	66

As Dr. Tatham points out, the death-rate from diabetes in males during the last 10 years is double the rate for the

10 years 1861-70, and amongst females, it is three times the rate for that period. In the United States, in Paris, in Denmark, in Germany, and in several other countries, a similar increase in the death-rate has been observed.

In Berlin the annual death-rate from the disease per 100,000 inhabitants was as follows (Fr. Prinzing, quoted by v. Noorden):—

1871-1875	-	-	2.2	Males.	1.2	Females.
1876-1880	-	-	4.0	„	2.0	„
1881-1885	-	-	4.6	„	2.6	„
1886-1890	-	-	6.2	„	3.8	„
1891-1895	-	-	9.3	„	5.5	„
1896-1900	-	-	11.6	„	6.9	„
1901-1905	-	-	20.7	„	12.3	„

Of course, there can be no doubt, that part of the apparent increase of the death-rate is really owing to the increased accuracy in the diagnosis of medical cases during recent years, and it is not easy to decide to what extent the apparent increased death-rate is due to this cause.

From the statistics quoted, we may conclude that diabetes is becoming very much more prevalent in England and in the countries already named; or that the mortality from the disease was formerly underestimated; or that the increased death-rate is due to both causes. Whichever of these conclusions is correct, diabetes must now be regarded as a much more formidable disease than 30 years ago; and these statistics suggest the consideration as to whether anything can be done to prevent or postpone the onset of the disease. So long as we are ignorant of the exact cause, its prevention is, in very many cases, impossible. In many cases of diabetes, before its onset there has been nothing in the medical history of the individual, or in his surroundings, or mode of life, which could suggest the possibility of this disease developing. But when we consider what is known respecting its aetiology, it is clear that certain individuals are more liable to develop diabetes than their fellow men; and, in certain individuals, the question of the prevention of diabetes, or the postponement of its onset, is worthy of very careful consideration. If we can postpone its onset till after middle life the affection is less serious. It is the general medical practitioner who has

sometimes the opportunity of giving advice as to the mode of life, etc., which is desirable, with the object of preventing or postponing the onset of diabetes. A consideration of its ætiology will indicate the mode of life, diet, etc., which is advisable with the object of preventing the disease.

II. ÆTIOLOGY.—*Age*.—The risk of the disease is greater after 30. The percentage of cases at different ages is shown by the following table. It indicates the age of the patients when they first came under my observation :—

				Private Patients.
Under 10 years	-	-	-	3
10-20	„	-	-	14
20-30	„	-	-	28
30-40	„	-	-	30
40-50	„	-	-	60
50-60	„	-	-	72
60-70	„	-	-	38
70-80	„	-	-	5
				<hr/> 250

Heredity.—A family history of the disease is often obtained. In 22 per cent. of a series of private diabetic cases, I obtained a family history of the disease; and this may be regarded as a minimum estimate.¹ In cases, under the age of 40, a family history of the disease is more frequently obtained than in those over 40. The relatives of the diabetic patients, who had also suffered from the disease, were most frequently brother, mother, father, sister.

Race.—Amongst the Jews diabetes is much more frequently met with than amongst Christians. Wallach has clearly demonstrated the greater frequency of the disease amongst Jews in Frankfurt (am Main). In Manchester, diabetes appears to be much more common amongst Jews of the middle and wealthy classes than amongst Christians. Prof. v. Noorden, who had excellent opportunity of observing the racial influence in Frankfurt, states that the excessive mortality from diabetes in the Jews of that town was observed chiefly amongst the well-to-do section of the inhabitants, and that amongst the poor the difference between Jews and Christians was not so decided.

In most cases the Jew diabetics are stout or well nourished,

¹ See writer's article, *Med. Chronicle*, Jan. 1909.

and the disease is often of a mild form.

I think it is probable that excess of food, deficient exercise, and mental strain from excessive work, play a very important part in the causation of the disease amongst the Jews, in addition to racial influence *per se*. In Malta and Paris, the death rate from diabetes is high. The disease is said to be common in India and Ceylon. In India the Hindus suffer most; the Mohammedans are much less frequently affected.

Occupation and Social Position.—The reports of the Registrar-General (*Supplement to the 65th Annual Report, 1907, Part II.*) show that the mortality from diabetes mellitus varies considerably in different occupations. It is highest amongst innkeepers and publicans. Amongst barristers and solicitors it is "three times the average, and higher than in any other occupation in the list, except innkeepers." Amongst medical men the mortality is also high. The mortality amongst chemists and druggists is high, but is less than amongst medical men. In occupations, in which there is great mental worry, mental strain, or excitement, there appears to be an increased risk of diabetes developing. Hence the risk of diabetes developing is worthy of a thought in the case of medical men who have a very large practice, which causes much mental strain, especially if little exercise can be taken, if the amount of food eaten should be large, and if there should be a family history of the disease. Prof. v. Noorden points out that 8 per cent. of his male cases were medical men. He considers that wealth and culture increase the risk of the disease ten times. Wörms has pointed out that, in Paris, 10 per cent. of the men, who do much mental work and take little exercise, are glycosuric.

I am inclined to think that the mayors and aldermen of our large towns, as well as lawyers and medical men, are particularly liable to suffer from the disease. I have also met with a number of cases of diabetes in so-called "working men" (men whose occupation is chiefly hand work), in which the symptoms were first noticed directly after a period of very heavy work. These patients, mechanics and other workmen, had for many weeks, or months, worked for several hours in the evening in addition to their ordinary heavy day's work

(*i.e.*, had worked "overtime") or had been engaged in night work. Very great physical and mental strain had been caused by the work for some months, and then diabetes had developed.

Diabetes affecting both Man and Wife.—Attention has been often drawn to the fact that, in rare instances, when a man has become diabetic, his wife has developed the disease later ; or the wife has become diabetic first and the husband later.

Amongst 250 private cases of diabetes, seen in consulting practice, I have met with five instances, *i.e.*, 2 per cent., in which man and wife have both suffered from the disease. In three instances, the husband was affected first, in two the wife first. It appears probable that, in many of the instances, when a wife has become diabetic after the husband, the anxiety and mental and physical strain, caused to the wife by nursing the diabetic husband, have been very important factors in the production of the disease in the former ; or, when the wife has suffered first, the mental worry and anxiety, caused to the husband, have predisposed to the disease in the latter. In other cases, the diabetic man and wife have both been subjected to the same severe mental strain and worry, or both have taken excess of alcohol, or excess of sweet food.

Diet.—In health, the power of sugar destruction in the system is not unlimited, and, if a very large quantity of saccharine material is taken, a trace of sugar will appear in the urine for a short time (alimentary glycosuria). But, in the normal condition, glycosuria cannot be produced by starchy food, however great the amount.

From the facts just stated, it is reasonable to expect that if a large amount of saccharine food, taken at one meal, can produce a temporary glycosuria in the normal state, the consumption of a great excess of saccharine food for a long period may gradually diminish the power of sugar destruction, and, finally, produce a true diabetes ; whilst the prolonged consumption of starchy food would have no injurious effect.

It is well known, also, that when diabetes has developed, restriction of the carbohydrates of the food often increases the tolerance for carbohydrates, in course of time ; but, if carbohydrates are allowed, the power of sugar-destruction in the system gradually diminishes. Further, it is usually found that sugar is more injurious than starch. In an individual,

whose sugar-destroying power is diminished, it is reasonable to expect that, by the daily consumption of an excess of sugar, the sugar-destroying power would gradually become more and more defective until a true diabetes occurred. Though this cannot be definitely proved, the history of many cases of diabetes lends some support to the view.

It is certain that, in many countries where the diet consists chiefly of starchy food, diabetes is very rare, and therefore many observers do not regard diet as a factor of importance in the causation. But it appears worthy of further careful consideration, whether the prolonged consumption of large quantities of foods and beverages, containing much sugar, has not a distinct influence in causing diabetes.

I have met with many cases, in which very large quantities of sweet foods, or beverages containing much sugar, have been taken daily for a long time before the onset of the diabetes (9 per cent. of a series of cases); and I think it highly probable that this has been an exciting factor of the disease. In some of these cases, there has been also heavy mental strain, through business or professional work.

Alcohol and Sweet Beverages.—It has been shown, that in great beer drinkers alimentary glycosuria can often be produced more readily (*i.e.*, with a smaller quantity of glucose) than in healthy persons. A history of very great alcoholic excess is sometimes obtained from diabetic patients. It appears probable that, as a result of alcoholism, the sugar-destroying function of the system is weakened, and alimentary glycosuria occurs; that later the sugar-destroying function is lost, and permanent diabetes follows. Strümpell believes that it is excessive beer drinking, which is the cause of certain cases of diabetes.

Many diabetics, of course, have never taken alcohol in any form; but, on the other hand, the disease sometimes occurs in persons who have been exceedingly intemperate, and the fact just mentioned, with respect to alimentary glycosuria, makes it probable that excess of beer, or of alcoholic beverages containing much sugar or carbohydrates, predisposes to diabetes.

The fact that the mortality from diabetes in England is greatest amongst innkeepers and publicans is in favour of this relationship. Strümpell states that, in his opinion, it is no

accidental coincidence, that diabetes occurs so frequently amongst brewers and innkeepers in Bavaria. I have met with many cases, in which very great excess of alcoholic beverages, especially beer and sweet wines, or of non-alcoholic sweet beverages, has appeared to have played a part in the causation of the disease.

In one of my diabetic cases, the patient had for many years drunk enormous quantities of beer daily ; and *post-mortem* examination revealed marked cirrhosis of the pancreas. In other cases, the patients had taken great excess of wine (especially port wine) and spirits, or of whiskey well *sweetened with sugar* for a long period before the onset of diabetes. In another case, the patient had taken daily, for a long period, many glasses of milk, each containing *two tablespoonfuls* of sugar. In a number of cases, before the onset of the disease, the patients had taken daily for a long period a large quantity of herb beer, or temperance beer, containing much sugar. In another case, for some years, the patient had taken 10 to 12 cups of tea daily, each containing three lumps of sugar (30 to 36 lumps of sugar daily). Possibly the great excess of sweet food, or sweet drink, or alcoholic beverage, was not the only factor in causing the diabetes in these cases ; but, from what we know of alimentary glycosuria, I think it must be allowed that this excess very probably acted as an exciting cause of the disease, or at least hastened its development. There was a history of great excess in alcoholic beverages in 6 per cent. of my private cases, and in 17 per cent. of hospital cases. A sedentary life predisposes to diabetes, especially when an excess of food is taken.

Psychical Causes.—Many cases of diabetes follow great mental shock, mental excitement, intense mental worry or anxiety, great sorrow, or great mental overstrain in study, in professional or business life (35 per cent. of a series of cases). The patient has usually been quite well previous to the mental shock, anxiety, or strain, and diabetes has developed immediately or very soon afterwards. In many cases the health has been so impaired ever after the mental strain or shock, that there can be no doubt that it has played an important part in the causation of the disease.

Overwork (Physical).—Cases in which the disease has

developed after a period of very hard physical work have been already mentioned. It appears very probable that excessive strain through work of this kind acts as an exciting cause. *Overstrain* through *nursing* a sick relative is sometimes followed by diabetes. I have met with many cases, in females, in which the disease has followed an overstrain through nursing a relative during a long and fatal illness. Much rest and sleep have been missed, and there has been also great mental anxiety.

Pregnancy.—Glycosuria, or diabetes, occasionally develops during pregnancy; but, after parturition, the urine may become normal. During one or more subsequent pregnancies, glycosuria may again occur, and disappear after parturition, or it disappears and returns later, and a permanent diabetes develops. In other cases, the glycosuria of pregnancy does not disappear after parturition, but advances to a severe diabetes. Occasionally, diabetes directly follows parturition, or a miscarriage, or an abscess of the breast which had developed during the period of suckling. Normally, lactose is usually found in the urine during lactation, and, in many cases, during pregnancy. It is often present in the urine after a miscarriage, and when the breasts are engorged with milk at the time of weaning the child, and also when there is inflammation of the breast. It appears probable that pregnancy, the puerperal state, miscarriage, or an abscess of the breast, has occasionally been a predisposing factor in the causation of diabetes, and has increased the injurious influence of some other condition. If the urine, during pregnancy, should contain true *glucose*, in large or considerable quantity, and especially if other diabetic symptoms should be present, it is important that future pregnancies should be prevented, even though the urine may become free from sugar after parturition. In such cases, there is evidently an abnormal condition of sugar metabolism, and repeated pregnancies would tend to increase the risk of a true permanent diabetes developing.

External injuries are occasionally followed by diabetes, and the association is so close that there can be little doubt that the injury has been the exciting cause. Usually the injury has been to the head.

Association with other Diseases.—Diabetes or glycosuria

occasionally develops in very obese individuals, in those who suffer from gout, and in a rare affection acromegaly. Women who are very stout appear to be liable to diabetes at the climacteric period. Usually there is obesity for many years before diabetes develops. The diabetes, as a rule, develops after 40, and is of a mild form. In another group of cases, obesity occurs in young individuals, at an age when obesity is rare: it develops rapidly, and to a marked extent, and then symptoms of diabetes in a severe form appear. Professor v. Noorden describes a form of obesity, in which the burning up of sugar is limited, but not the synthesis to fat—cases of obesity without glycosuria, or masked diabetes. Later both the burning up of sugar and the synthesis to fat are impaired, and glycosuria occurs—diabetes with obesity. Professor v. Noorden has pointed out that, in some cases of obesity, large quantities of starchy food can be tolerated without glycosuria occurring, but, after comparatively small quantities of grape sugar (100 grammes), considerable glycosuria occurs. He thinks that, by this experimental test, a latent diabetic diathesis can be discovered at an early stage, and by careful regulation of the diet the patient may derive great benefit.

Acromegaly is a very rare disease; but frequently glycosuria or diabetes develops at a late stage of the affection. In 5 of my own cases of acromegaly, there was slight glycosuria in one, and well-marked diabetes in three cases. In two of the latter, death occurred from diabetic coma. In only one of the five was glycosuria absent at the time when the patient was last seen. Sugar was present in the urine in six out of 21 cases of acromegaly which I collected from medical literature a few years ago. It was present in 12 out of 97 cases collected by Hansemann.

It has been thought by some physicians that the *climacteric* period favours the occurrence of diabetes in women. In many cases diabetes certainly commences just after the cessation of menstruation. I have also met with several cases, in which diabetes has developed directly after an abdominal operation on the female generative organs, *e.g.*, removal of the ovaries, or uterus. Whether cessation of menstruation, or the mental worry and anxiety produced by the operation, had been the exciting cause was not clear. Whenever there is a family

history of diabetes, or when the patient is very stout, the possibility of a severe gynæcological operation being followed by diabetes should be borne in mind.

Cases are occasionally met with in which diabetes has followed an acute infective disease or severe illness. I have seen many cases of diabetes following influenza.

In a few of my cases, severe dyspepsia has been an antecedent of diabetes, and much importance is attached to this antecedent by many medical men in India.

The following table shows the frequency of certain antecedents in the history of 250 cases of diabetes in private practice:—

CERTAIN ANTECEDENTS IN 250 CASES OF DIABETES.

1. Great mental worry, anxiety, shock. (In 8 of these cases, an excess of sweet food, or sweet beverages, had been taken; in 1 an excess of wine; in 1 there was a history of injury; in 11 there was a family history of diabetes)	63
2. Mental worry and anxiety, caused by serious illness of a relative (usually husband or wife), often associated with prolonged strain and loss of sleep through nursing the relative. (10 male cases; 6 female.) (In 4 of these cases, there was a family history of diabetes; in 1 an excess of sweet food had been taken)	16
3. Mental worry, anxiety, and overwork. (In 2 of these there was a family history of diabetes: in 1 an excess of sweet food had been taken)	10
4. Overwork, very severe physical strain. (In 2 of these there was a family history of diabetes; in 2 there had been an attack of influenza just before the onset of the diabetes; in 1 an excess of sweet food had been taken)	10
5. Alcoholism. (In 3 of these there was a family history of diabetes; in 1 there had been great mental worry and strain; in 1 overwork)	15
6. Great excess of sweet food or sweet drinks for a long period. (In 2 of these cases there was a family history of diabetes; in 2 great overstrain at work; in 4 great mental worry; in 2 there had been an attack of influenza just before the onset of the diabetes)	23
7. Onset during pregnancy	4
8. Onset just after an attack of influenza or severe cold. (In 2 of these there was a family history of diabetes)	5
9. Onset just after enteric fever	1
10. Onset just after rheumatic fever	1
11. Onset just after an operation on the uterus or ovaries. (In 1 of these there was a family history of diabetes)	2
12. Family history of diabetes in	49

Future pathological research may reveal the exact cause or causes of diabetes; but the influence of the antecedents just considered, as exciting or additional factors in the production of the disease, will probably not be refuted by any such discovery; just as the discovery of the tubercle bacillus has not affected the views as to the importance of bad air, overcrowding, etc., as predisposing to phthisis. It appears probable that diabetes mellitus is a group of symptoms produced by different pathological changes. But whatever may be the pathogenesis of diabetes, the previous history of clinical cases shows that certain antecedents of the disease are common, *i.e.*, (1) mental anxiety, shock, overstrain; (2) excess of alcoholic beverages; (3) excess of sweet foods, or beverages containing sugar. Also, in many cases—at least 22 per cent.—there is a family history of the disease.

III. PREVENTION OF THE DISEASE, OR POSTPONEMENT OF ITS ONSET.—The advisability of precautions for preventing, or postponing the onset of diabetes may be considered in the following cases:—

(1) In the case of individuals who have a family history of the disease, and especially if a brother or sister has suffered.

(2) In the case of Jews, whose profession or business causes great mental overstrain, especially in the case of those who are very ambitious, those who are very stout, eat an excess of food, and take little exercise.

(3) In the case of women whose urine has contained a considerable amount of grape sugar during pregnancy, which has disappeared after parturition.

(4) In cases of gout, acromegaly, and great obesity, especially if the obesity should have developed at an early period of life.

(5) The possibility of diabetes is worthy of a thought in the case of men who have reached the age of 40 or 50, who have had great mental strain in their profession or business, who have been very ambitious, worked very hard, and taken little exercise. If such individuals have taken an excess of food and alcohol, and have become stout, there is a greater risk.

(6) In very stout women just after the climacteric period, and after an operation on the uterus or ovaries, the risk of diabetes is worth bearing in mind, especially when there is a

family history of the disease.

(7) When the urine has been found to contain a trace of sugar *temporarily* after an acute illness, an injury, an excess of sweet food, etc., or at the examination for life insurance, the question of the prevention of *permanent* glycosuria, or true diabetes, requires consideration.

(8) In all cases of permanent slight glycosuria, it is desirable that the mode of life, diet, etc., should be carefully considered and regulated, with the object of preventing, if possible, the affection from developing into a severe form of diabetes. Many cases of slight or temporary glycosuria develop, in course of time, into severe diabetes; but it is important to remember that this is not always the case, and, both in the young and the old, a slight glycosuria may disappear or remain slight or intermittent, without progressing into severe diabetes.

When a consideration of the family history or life history of any individual leads us to think that there is a special risk of diabetes developing, the following precautions as to the mode of life appear to be advisable, in view of what is known regarding the ætiology of the disease.

Sugar, sweets, chocolate, very sweet fruit, and all articles of diet or drinks containing much sugar should be avoided. It is easy for most individuals to acquire the habit of taking food without sugar; but if there should be difficulty in this respect, saxin or saccharin may be used.

Unless actual glycosuria has been detected, there is no reason why an average amount of starchy food should not be taken; but of course great excess of starchy food would not be desirable. As already mentioned, observations on alimentary glycosuria show that sugar is much more powerful than starch in producing glycosuria.

The total amount of food should not be excessive, especially after the age of 40. Strict moderation as regards all forms of alcoholic beverage is important, and sweet wines (especially port, tokai, and champagne) and liqueurs should not be taken. Beer should only be taken in very moderate quantities. All beverages containing much sugar should be avoided.

A sufficient amount of outdoor exercise is very desirable, and this is particularly important if the occupation should be a sedentary one. Dyspepsia and constipation should be

treated, since severe dyspepsia is occasionally an antecedent of diabetes. As mental worry, anxiety, mental overstrain, and overwork are so often exciting causes of the disease, it is advisable that those who are considered to be predisposed to diabetes should, if possible, choose an occupation in which there is not a special risk of these injurious influences, or that the work should be so arranged, or modified, as to diminish this risk to the minimum.

The possibility of diabetes developing is worthy of a thought in the case of successful barristers, solicitors, and medical men, who are working at high pressure, and have little time for exercise or holidays, and also in the case of publicans, who are taking alcoholic beverages in liberal quantities.

The physical and mental overstrain, connected with the nursing of a sick relative or friend through a long illness, should be avoided by those who are thought to have any predisposition to diabetes.

In the case of married couples, if one should suffer from diabetes, it is probable that the liability to diabetes in the other is very slightly increased, whatever may be the explanation.

In cases in which a temporary or slight glycosuria has been detected, in addition to the precautions already mentioned, the starchy articles of food should also be restricted, because it is most important to prevent, or postpone, the development of true severe diabetes in such cases; and it is important to remember that, if the development of true diabetes can be postponed until the individual is past middle life, the disease will probably be of a less severe form.

When a considerable amount of grape sugar has been present in the urine during pregnancy, and especially if there have been thirst and diuresis, it is most desirable that pregnancy should not occur in the future.



CANCER OF TONGUE.

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THE anatomy of the tongue is rather complicated, but it is distinctly, both morphologically and physiologically, a bilateral organ, and, for practical purposes, made up of two closely united halves, just as is the case in other organs, such as the mouth, nose, and external genitals. When a cancer has its origin distinctly on one side, we may consider that, for a time at least, however short, the spread will be unilateral. The dividing line, the median raphe, is said by Kuttner¹ to be not quite of the nature of a lymphatic water-shed, but that a free flow of lymph takes place indifferently from the whole dorsum to either side. This is true generally in all the closely apposed bilateral organs referred to, and it is undoubtedly quite common, at least in late cancer of the tongue, to find the lymph glands on the opposite side affected. This is just what we should expect after cancer cells have permeated along the lymphatic vessels and across the centre into a new lymphatic area, as explained by Handley² when infection of the glands of that side would quickly follow. The constant movement of the tongue, both as a whole and intrinsically, must also materially hasten the spread of cancer cells in all directions. Accordingly, when the growth is distinctly dorsal, and is fairly far advanced, we may be sure that the lymph glands and vessels on both sides are already affected. This is the condition, unfortunately, of most of the patients sent to the surgeon, and makes the prognosis very uncertain even after a radical operation on one side only, and if one decides to operate on both sides simultaneously, the gravity of the operation becomes rather alarming. It is still sometimes debated, in all seriousness, whether it is advisable in all cases to remove the lymphatic glands even on the same side when the disease is distinctly unilateral,³ but it is difficult to reconcile such an attitude with the modern treatment of cancer in other regions, *e.g.*, the breast, and it is equally difficult to understand why a unilateral excision of the organ should always be practised by men who

note at the same time the frequency of recurrence on the opposite side of the neck. There is no question that removal of the tongue alone, even in almost hopeless cases, will make the patient's end more comfortable. The disease is so long confined to the supraclavicular region of the body, that an attempt to remove infected glands, immediately they are noticed after a radical operation, should be plainly put before the patient as the only means, and that a by no means hopeless one, of staying a general infection of the body, or the equally certain destruction of life by local death of the growth, and infection by organisms both pyogenic and putrescent.

Cancer of the tongue is a squamous-celled epithelioma, and, though very liable to infect the glands early, does not give rise to distant metastases readily. The male sex, in 100 cases collected from various hospitals, was found to be affected five times as often as the female sex (Stutzer),⁴ and this is explained by the habits of smoking and drinking being more common among men than women. Age seems to play a part here as elsewhere, the 5th and 6th decades giving the greatest number of cases, while they gradually decrease in frequency in the decades above and below, there being few recorded cases below 20 years.

The Arterial Supply of the tongue is from the lingual, the facial, and the ascending pharyngeal, but hæmorrhage is severe only from the lingual and from the pharyngeal in basal cancer.

The Nerve Supply is the glossopharyngeal, the hypoglossal, the lingual, and the chorda tympani, the hypoglossal being the motor nerve.

Lymphatics of the Tongue.—These are fairly regular in arrangement. They arise, first, from the mucous membrane, and, second, from the muscles. A close superficial network extends over the whole of the dorsum and down the sides, and there is free intercommunication all over this network. According to Kuttner, lymph from one side of the tongue flows away to both sides, and these lymph-channels run to the submaxillary and to the deep cervical lymph glands, while some may run directly to the deep cervical glands

lying just above the sternum. From the posterior part of the tongue, the channels run to the glands about the carotid. The deep lymphatics from the muscles also join the mucous channels.

To go more into detail, we find that there are really four principal collecting trunks:—(1) those from the tip ; (2) those from the lateral margins ; (3) those from the back or base portion, and (4) a central group.

The first run along the sides of the frenum, and, keeping close to the jaw, pass down, some between the fibres of the mylo-hyoids to the nearest sub-mental gland, and others between the geniohyoglossus and mylohyoid, across the greater horn of the hyoid behind the pulley of the digastric, to reach the glands at the crossing of the omo-hyoid and internal jugular vein.

The second, or lateral border group, may collect lymph from any part of the dorsum between the tip and the angle of the V-shaped line, and these run down either side of the sublingual salivary gland, the external channels to terminate in the anterior submaxillary glands, and the internal to go to the glands along the internal jugular vein, but mostly to a gland lying under the posterior belly of the digastric. There are some glandular nodules on these trunks, which constitute the so-called lateral lingual glands, and which may become considerably enlarged in epithelioma of the tongue.

In the third group, the trunks from the posterior or basal part of the tongue around the circumvallate papillæ run straight back as far as the glosso-epiglottidean folds, and then over either side indifferently to join another group, the lateral trunks from the lower edge of the tonsil. They traverse the lateral pharyngeal wall, emerge through the constrictors, superior or medius, and follow the course of the dorsalis linguæ and lingual arteries to terminate in the large gland under the digastric lying on the internal jugular vein. This is a very important gland in all tongue affections.

The fourth group collects from the centre of the dorsal network, but, instead of crossing the lateral margin, runs down between the two geniohyoglossi and appears in the submaxillary space on the deep surface of the mylohyoid. These vessels go to either side, cross the greater horn of the hyoid

behind the digastric, and end in the internal jugular chain of glands, down sometimes even to the sternum. The glandular nodules, found in the first part of their course, constitute, when enlarged, what are known as the intra-lingual glands.

It will thus be seen that the most important glands of the tongue as a whole, are those situated on the internal jugular vein between the digastric and the omohyoid, but that glands along this vessel may be primarily affected above and below these points, while the fascia and the muscles on the floor of the mouth are liable to harbour glandular nodules, which might become the site of recurrence if not removed. It should also be noted that central and basal cancers can never be considered to be unilateral however early they may be seen.

The above description is practically the same as Sappey's, which is thus described by Butlin.⁵ "A study of Sappey's plates show four groups affected. (1) A submental group which lie beneath the floor of the mouth behind the lower jaw; (2) the submaxillary, some of which actually lie in the substance of the salivary gland; (3) the parotid, and (4) the carotid, which lie over the course of the carotid artery, and particularly over the bifurcation of the common carotid." It is to be noted however, that Sappey does not describe any lymphatics corresponding with the fourth group, and, as Butlin in his earlier operations followed Sappey's description, this would account for his leaving the lower part of the internal jugular chain unexplored.

It is very evident that cancer of the tongue may quickly become very widely spread on both sides in the neck, but, as stated above, it does not tend to set up metastases elsewhere very rapidly, probably owing to the numerous glands which arrest its progress, and also because these lymphatics discharge into the right and left subclavian veins, and thus destruction of cancer emboli is likely to occur.⁶ It is here therefore, more perhaps than in any region, that we must try to diagnose cancer early, so as to have successful results, and to do a radical operation on one or both sides in every case of lingual cancer.

Diagnosis.—Beyond the fact that continued irritation of the mucous membrane and consequent ulceration may predispose to cancer in the tongue, there are probably no recognisable

precancerous stages. It is either cancer or not cancer, but even with the aid of the microscope its true nature may not be evident. Predisposing conditions, also irritative, are described as leucoplakia, ichthyosis, chronic superficial glossitis, etc. All warty growths and thickenings of the surface, or ulcerations, are distinctly suspicious, and while they may be syphilitic and disappear with proper treatment, excision of a small part for diagnosis is advisable, and should be insisted on in every case. Butlin,⁷ in his earlier communications, very severely condemns all waiting policy, and advises⁵ a wide elliptical removal of all suspicious warts, excoriations and fissures, blisters and pimples, and ulcerating plaques, especially as they are all superficial conditions. He later⁸ gives us four conditions, which surgeons have usually regarded as precancerous states, but which Drs. Bashford and Murray have shown to be true cancer. These are:—

1. A flat, very slightly raised, smooth, red, glazed plaque, feeling like a thin piece of gristle in the surface of the tongue, and not thicker than a threepenny or sixpenny piece, and looking and feeling like a primary hard sore.

2. A white, warty growth, not ulcerated, and scarcely indurated at its base.

3. A slight thickening and hardening of an old leukoplakic area, rather distinguishable to feel than sight, and very likely an earlier stage of 1.

4. A nodular plaque, red, and commencing to ulcerate, with drawing in of the surrounding tissues.

Cancer of the tongue may also be confounded with the following:—

- (1) Ulcers caused by a sharp tooth. There is less induration here and they look shallow, and, when the tooth is removed, they heal rapidly.

- (2) Tuberculous ulcers, which are rarely found in healthy people. Other symptoms of tubercle infection are generally met with in the lungs or in the larynx, and the ulcer is quite shallow with the edges undermined. They are usually situated laterally and may be quite painful, more so even than cancer.

- (3) Syphilitic sores. Cancer is frequent at the sides opposite the molar teeth, and gummata or syphilitic lesions at the tip or dorsum. An ulcerating gumma has a tough laminated

mass often covering its base, which can be pulled off without bleeding, while cancerous ulcers bleed easily, and are soft and necrotic. Pain is also more frequent in cancer.

The nodular form of cancer in the tongue substance is not so often seen. It is usually single when it occurs, while gummata are more often multiple and there are other tertiary signs. It is quite likely that these nodular cancer growths are secondary deposits in the lymph nodes of the lymphatics passing down the median raphe, and that, if searched for, a superficial primary focus might be found.

Syphilitic ulcers may also become malignant. This is very confusing, as the history of syphilis may be forthcoming, and there may even be considerable improvement under iodide treatment. Jonathan Hutchinson⁹ says that at least one third of tongue cancers start on gummatus ulcers, and this is also the percentage in Jennings's cases.¹⁰ Leukoplakic patches are often found along with cancer ulceration.

(4) Cancer of the under surface of the tongue or floor of the mouth may be simulated by ulceration of the salivary ducts, especially that set up by an impacted salivary calculus. The induration in the latter case is less marked, and the calculus can be generally felt with a probe. It must not be forgotten, however, that this calculous irritation may lead to cancer, and this will generally be of the cylindrical-cell type. In cancer of this region, the spread is generally forward to the jaw, which may become completely destroyed even before there is much evidence of growth externally, or even within the mouth. Such a case was lately under the writer's care.

(5) Sarcoma of the tongue is quite a rare disease, having been found mostly in young women. Marion¹¹ has collected over 20 cases, but some of them are doubtful. Sarcoma is softer than either cancer or gummata, and is much more rapid in its growth than either.

Pre-operative Treatment.—The condition of the patient should be improved by feeding, and the mouth should be cleaned as thoroughly as possible for some days before the operation. All carious teeth are removed, and the mouth is swabbed out and irrigated with weak carbolic, formalin, or soda solutions, three or four times a day, and always after feeding. A free use of the tooth-brush is also necessary.

Feeding is done by the stomach-tube or catheter, passed either by the nose or by the mouth, if it appears that this method may be adopted after the operation. This should be practised till the passing of the tube produces no retching or vomiting. All feeding and cleaning of the mouth must be carried out with perfect aseptic technique, and the food must be sterilised and liquid. The gums, from which teeth have been removed, must be allowed to heal before the operation. The tumour, or ulcer, on the tongue, should also be widely excised, and the edges of the wound brought together or cauterised. The excised part will be available for microscopic examination, and, if undoubtedly malignant, the major operation would be undertaken with less hesitation by both patient and surgeon. By these means the mouth may be rendered almost, if not quite aseptic, and there will be little chance of sepsis and aspiration-pneumonia, which are still the bugbears of most surgical writers, following the real operation.

Operation in Two Stages.—Numerous operations have been proposed with the object of getting easy access to the tongue, and of effecting a complete removal of the tongue focus and the affected glands, but few of these have aimed at a complete removal of the disease *en bloc*. To remove the glands first, as suggested by Poirier,¹² and Child,¹³ is not good surgery, as the infection will, in the interval between the two operations, most assuredly be carried by other lymph channels to other glands on the same or opposite side. The original focus should on this account be attacked first in all two-stage operations. If the patient declines the second operation, he must take the consequences. The surgeon has no right to compel him by reversing his operations for that purpose. It has been frequently suggested that cancer cells do not lodge in the lymphatic channels between the original focus and the glands.¹⁴ It is true that "permeation" has not been so carefully observed in the case of the tongue, as it has been in the breast by Handley, but there seems no reason to ignore this method of infection, and the percentage of recurrences in the floor of the mouth leaves no doubt that the vessels do harbour infection, as otherwise the recurrence locally could not be explained when free removal of the tongue wide of the disease has been performed.

Stage 1.—If the operation is to be done in two stages, and this should be the case in all weakly patients, it is advisable not to open up the vascular sheath at the first operation. As most of the bleeding comes from the lingual arteries, these had better be secured by careful dissection when near the usual point of election. They will be seen in the field of operation early. Temporary section of the jaw is not necessary. It causes severe shock, and, although union is fairly satisfactory, the wound is more difficult to keep clean. Every effort should be made to close the cavity left as completely as possible, so as to obtain primary union, and this is more difficult if the maxilla has been widely opened during the operation. Feeding by the mouth with the stomach-tube after suture of the jaw is more difficult and painful, and consequently the strength of the patient is not so easily maintained. It is better and easier to split the cheeks in the oral line back to the masseters, if more room is required, as these heal together readily and quickly.

The patient is put in a modified Trendelenburg position, with the head extended over a pillow so as to give free access to the surgeon, and to allow any blood to flow easily out of the mouth and nostrils. The anæsthetist, too, is better to be out of the surgeon's way as far as possible. Thomson and Carless¹⁵ prefer tracheotomy in basal tumours, while Butlin, Deanesly,¹⁶ and most Continental surgeons open the larynx or trachea in all cases. Some prefer the patient to be only semi-anæsthetised, so that blood and mucus can be spat out or swallowed, but this semi-consciousness hampers and hurries the surgeon, and tends to produce imperfect work. The anæsthetic, preferably chloroform, should be given through a Junker's apparatus, or by Crile's double tube method, and a funnel-shaped mask. The chloroformist should be as careful in his aseptic technique as the other assistants.

The facial vessels are first secured by two silk sutures passed one on either side of the incision line, and tied over the skin. This materially checks oozing, while the incision below the chin is being carried right round opposite the inner margin of the maxilla from angle to angle, as shown in Fig. 1. This flap, which includes skin and platysma, is dissected back to half an inch below the hyoid all round to the carotid sheath, which is not opened. The fat and fascia are raised off the sterno-

hyoid, omo-hyoid, and thyro-hyoid muscles, and removed clean upwards from the hyoid bone. The superficial part of these

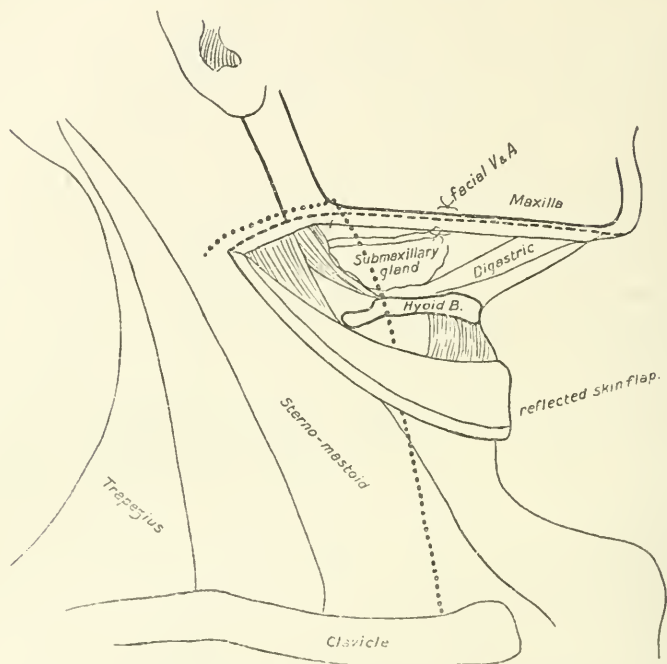


Fig. 1.—Two stage operation. Interrupted line indicates 1st stage incision. Dotted line indicates 2nd stage incision.

muscles should be removed as well. The origins of the mylo-hyoid and hyoglossus, and the attachment of the digastric pulley and the stylo-hyoid are freed and raised, when the lingual artery and vein will be seen well back in the posterior angle of the wound. These are secured on both sides. All the muscles, attached to the hyoid in front of the lesser horn, may be detached at this stage, but the stylo-hyoid ligament and the middle constrictor behind the lesser horn should be left. The hypo-glossal nerve will be seen and divided, and the whole pushed up towards the floor of the mouth. The facial artery will soon be in view, and will be doubly secured and cut. The next step of the operation is done intra-orally. A central incision is made from the back of the symphysis between the lower incisors to the frenum and along the free

mucous edge of the tongue on either side, keeping well clear of the tumour. These flaps of mucous membrane are dissected back to the gum, and include only mucous membrane and sub-mucosa. The genio-glossi are next severed at their insertion into the jaw. The tongue is raised and pulled forward against the upper teeth, and the whole of the contents of the floor of the mouth are carefully freed from the maxilla internally. As the dissection is carried along either side, the tongue is readily brought forward, and, when it is freed well behind the lymphatic lateral drains from the primary focus, any hæmorrhage is stopped by gauze plugs, and the tongue is then allowed to retract and the mouth to shut. The upper edge of the external incision is now deepened, and the muscles and other tissues freed from the inferior surface of the jaw by dissection till the mouth is opened, when the tongue can be pulled out below the jaw, and removal finished by knife or scissors from above. The glosso-epiglottidean folds are cut and secured by silk tractors, and the whole of the tongue snipped away from the epiglottis. The cutting is slightly forward towards the hyoid body, the attachment to which is the last part to be severed.

The oozing, even with ligature of the above vessels, is free but never alarming, and can now be stopped by pressure for a few minutes with gauze. The lateral mucous membrane flaps are sutured to each other, and to the glosso-epiglottidean folds posteriorly with fine celluloid thread, and the skin flap is next sutured to the skin under the jaw and to the mucous folds by a few through-and-through sutures. The floor of the mouth is wiped clean and dry.

If the cheeks have been split, the mucous membrane is carefully adjusted by sutures of fine silk or celluloid thread, and the rest of the cheek sutured with silk-worm gut or by Meckel's clasps. It has been proposed to render this operation bloodless by injecting adrenalin into the lingual arteries before section and ligature, but this is hardly necessary, if there is not too great haste in the operation.

Post-Operative Treatment.—The surgeon now hands the patient over to a capable nurse, whose first duty is to keep the mouth dry till the patient comes out of chloroform. For convenience, a mouth-gag is kept in till the patient begins

to struggle to have it removed, after which he will not swallow discharges if kept awake. The patient is kept lying on the side opposite to the gag, and well on to his face with the head low. Great care must be taken by the nurse to keep the mouth free from mucus, saliva, and vomited matter till the patient quite recovers consciousness, as it is mostly at this stage that any irritating matter reaches the lung. It may not be out of place to add again that the nurse's aseptic technique must be faultless. After consciousness is fully established, an intelligent patient will manage the hygiene of his mouth himself with much less danger and pain than the ordinary nurse.

The patient assumes the sitting posture as early as possible, and gets up and about as soon as he can manage it, and washes out his mouth with weak carbolic, formalin, or soda solutions as before the operation. The discharge must not be allowed to collect and lie in the floor of the mouth. Feeding for the first 24 hours may be entirely by rectum, if the patient's condition is good, and, for the first ten days, he should get all nourishment sterilised, and passed into the stomach by nasal catheter or œsophageal tube. Feeding should be abundant and frequent, and he would require the undivided attention of a nurse day and night for the first two days at least, especially during sleep.

The removal of the glands of the neck proper, with their lymphatic channels, will be undertaken as soon after the primary operation as possible, but in no case till the patient has fully recovered, and is taking nourishment by the mouth freely and painlessly, and the mouth is quite shut off from the neck.

Stage 2.—Many incisions have been proposed here, too, and almost all of them have some objectionable feature. The chief point next to free access is to remove the tissues between the posterior end of the cicatrix and the hyoid bone, as at the primary operation these would be infected. If the glands are to be sought for on both sides, and this is generally necessary, then the incisions must be planned so that the scars will not draw down the chin too firmly in the middle line. This can be met by making the primary incision from the sterno-mastoid above forward parallel to the jaw, and above the end of the old

cicatrix, and then downward to the smaller horn of the hyoid bone. This will be just above the stylo-hyoid ligament. The skin incision is then carried down from here to the sterno-clavicular junction. This flap is dissected back well on to the sterno-mastoid muscle, which is cleaned and retracted, and the vascular sheath opened, and the whole of the fascia and fat and glands removed from the vessels, from the sternum up to an inch above the digastric muscle, which, with the stylo-hyoid, is removed. This is done on the opposite side as well at the same sitting, unless the cancer is far advanced, and the dissection is difficult, or involves removal of the large vessels. Such extensive removals will be rare, but everything not vital must go when once the operation has been begun, rather than leave the least visible trace of the disease behind. It is well to point out here that much tugging or irritation by rough swabbing or otherwise will induce cardiac and respiratory trouble, and is a common cause of post-operative shock in tongue operations. The external carotid and internal jugular may be ligatured and removed on one, or even both sides, should this be necessary, without fatal result or sloughing of the face tissues, and even the vagus and common carotid on one side have been sacrificed when too closely adherent to the cancerous growth.

The Post-Operative treatment will be similar to that in all extensive gland cases in this region.

Operation in One Stage.—The two-stage operation described above cannot be considered satisfactory, inasmuch as it involves section of the lymphatics, and consequently a risk of recurrence in the wound. The ideal operation should remove the whole of the tissues in one piece, but most patients could not stand this done bilaterally. Some of the cancers of the tongue seem so definitely unilateral that the second operation for excision of the glands on the other side might be done later with the patient's permission, though the objection of wound infection is again admitted. For the extensive operation now to be described, preliminary cleaning of the mouth and feeding by the œsophageal tube, so as to get the patient quite accustomed to its passage, are imperative, and the mouth must be kept clean by sterilisation of all food. There is great advantage in suitable cases in the morphin and atropin, or scopolamin narcosis, with an occasional whiff of chloroform administered

as above. Two incisions (*see* Fig. 2) are carried from the lower jaw just in front of the crossing of the facial vessels, which have been sutured as already described, one backward in

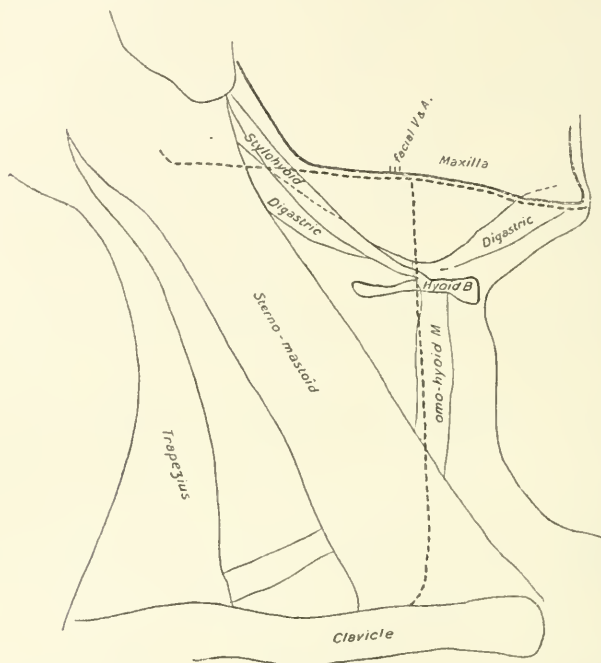


Fig. 2.—One stage operation. Interrupted lines show incisions for skin flaps.

the direction of the margin of the jaw, till well past the anterior border of the sterno-mastoid, and a second down to behind the sterno-clavicular joint. The skin and platysma are first reflected back on to the muscle, which is cleaned and retracted, and the sheath of the vessels opened in its whole length. All glands and tissues are dissected forward and upward, leaving the vessels quite clean, and even removing, if necessary, the whole of them and the vagus nerve. The glands about the bifurcation of the carotid, and up to well above the digastric muscle, and down below the level of the omo-hyoid below must be, in all cases, cleanly lifted up *en masse*. According to the position of the original cancer focus will now depend the extent of blood supply to be cut off, but the external carotid itself may be ligatured close to its origin, if desirable, or a

temporary clamp may be placed on the common trunk. In all cases the lingual and facial must be secured. This should be done with silk. The incision has now to be carried forward under the margin of the jaw, while the dissection is continued below. The posterior belly of the digastric and the stylo-hyoid and the hypoglossal nerve will have already been cut. The posterior flap, when its bed is quite cleared, is at once sutured closely down over the vessels, and above the hyoid, so as to entirely close off the vessels in the part behind.

The surgeon then works from inside the mouth. The mucous membrane is reflected, as described in the two-stage operation, close to the lower jaw, and the soft parts pushed inwards towards the tongue, the geniohyoglossi being cut through at their attachment to the jaw. After this stage it becomes necessary to carry further forward the dissection of the second flap under the chin, but the skin should be left attached to the underlying tissues as long as possible to preserve its vitality. The gradual freeing of these tissues above allows of the easy retraction upward of the lower jaw and head, so that the field of operation becomes quite superficial. Hæmorrhage, which till now has been comparatively little, will begin to be rather free after the middle line is crossed, and it is better to clear the tongue from the tip, taking with us the probably infected submental tissues. The tongue is pulled outwards, and the sublingual salivary glands on the opposite side are brought into view. This part is done by blunt dissection with the scissors, the tougher fibrous strands being doubly ligatured and cut, as hæmorrhage here is difficult to stop when once the tissues retract. As one works round at the side and below, the lingual artery and other vessels of the opposite side can be seen and secured before being cut, and the submaxillary gland is then reached. The facial artery should be spared on this side if possible, though a branch of it is usually encountered and ligatured. The tongue is now almost free, and, as both linguals have been secured, it can be cut across back to the epiglottis and the whole removed in one piece. The anterior skin flap is finally dissected off the mass.

This operation has the advantage of being comparatively bloodless, and by no means difficult, as all the vessels except

the opposite lingual are secured early, and access to any bleeding point is quite adequate. The nearest glands, except the carotid group on the opposite side, may also be removed in one piece with the tumour.

The mucous membrane is brought together as well as possible inside the mouth, and a lateral funnel of skin below the jaw is sutured to the mucosa internally. The vessels have been covered early before opening the mouth, and this was done by passing an end of the skin under the jaw and suturing it to the constrictors and hyoid muscles. The rest of the skin wound is sutured up. This opening under the jaw, where the skin is fixed to the mucous membrane and muscles, is an efficient opening for mouth drainage, and, if the mouth has been well attended to, before the operation, by an experienced nurse, who also takes special charge of the patient afterwards, there is very little danger from sepsis. The patient is turned on the affected side, and partially on to the face till completely conscious, so that everything runs out of the mouth, and this, or the lowered head position, must be kept up till the healing has fairly progressed, and risk of infection of the neck is past. No dressing is put over the wound.

Prognosis.—This depends very much on the condition of the patient, and the spread of the disease at the time of the operation. The operative death-rate in extensive operations has, hitherto, been excessive, as many of the cases have succumbed to such preventable causes as septic pneumonia, local sepsis, shock, and hæmorrhage. Butlin puts the deaths due to those at almost 85 per cent., while septic infection causes more than 50 per cent. of the immediate fatalities. If one considers that much more extensive operations for removal of tubercular glands can be done with an almost negligible mortality, and that septic pneumonia is rare after nose and throat operations and dental extractions under complete anæsthesia, one is forced to admit that a considerable factor must be the weakened condition and age of most of the patients that submit themselves to the surgeon, and for this the family physician is much to blame. With proper preparation of the mouth, and good technique during the operation, the death-rate should be reduced to below 20 per cent. for all operations offering a fair chance of complete eradication of the disease, and, of

course, a much smaller percentage for picked cases. Butlin's statistics for 333 cases¹⁷ gave a mortality of 12·7 per cent., being 7 per cent. when the tongue alone was removed, and 22 per cent. when the glands were removed, while a mortality of 25 per cent. is recorded when the jaw was divided. His own operation mortality in 129 cases⁷ is only 10 per cent., while von Bergmann's operation mortality is 17·6 per cent.⁴ Warren¹⁸ records a mortality of 12·9 per cent.

If one looks next at the cures in the survivors one is again disappointed. Barker¹⁹ gave an ultimate cure, taking the three years' limit, of about 5 per cent. to 8 per cent. in collected cases. Butlin estimates his own successes as over 25 per cent. Warren¹⁸ gives a cure percentage of over 17 in his more recent records. Others look upon all operative interference as ultimately valueless. There is a great divergence of opinion, too, as to the site of the recurrence. Butlin says 70 per cent. of recurrences occur in the floor of the mouth, while von Bergmann gives the same percentage as recurring in the glands. Deanesly²⁰ says local recurrence is the exception, while Gould and Warren²¹ say recurrence is the rule either in the cicatrix or in the glands. Poirier advocates an extensive three-stage operation, as does also Crile.²² Berger,²³ in a discussion following Poirier's paper, deprecated such a routine procedure as likely to bring a great shock mortality. He advocated instead the removal of the glands in the floor of the mouth, and the submental and submaxillary glands, and for this purpose he did median section of the jaw. He would not operate when the glands are much involved, as the gravity of the operation is disproportionate to the chances of success, but he would remove freely when the disease was still local, and is convinced that there are more cases of recurrence in the stump than in the glands. Terrier³ thinks that removal of the glands, owing to the septic nature of the buccal fluids, is likely to be not only useless but hurtful to the patient.

There would seem, from such diversity of opinion, to be room for a thorough revision of the methods of dealing with tongue cancer. Much might be done by more thorough buccal disinfection, and the depressing cardiac effects of the vagus from pharyngeal, and dissection irritation might be overcome, as Crile suggests, by the use of atropin or cocaine.

Morphin is likely to diminish the shock and the hæmorrhage, and to lessen the difficulty of regular anæsthesia. Perhaps, too, something might be done by the use of local anæsthetics with adrenalin during the operation, both to check hæmorrhage, and to reduce the quantity of chloroform necessary, and we must look to more careful and intelligent nursing for improvement in the large operative death-rate, and to better technique and wider removal for preventing recurrence.

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SOME POINTS IN THE TREATMENT OF ISCHIO-RECTAL ABSCESS AND FISTULA.¹

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THE common causes of ischio-rectal abscess and fistula are :—

A fissure or ulcer.	Tubercle.	Foreign bodies.
Ischio-rectal abscess.	Stricture.	

It used to be taught that most fistulæ are tubercular in origin, but this is very far from being the case. At St. Mark's Hospital, we have unequalled opportunities of studying the condition, and the statistics clearly show that the proportion of tubercular fistula is between 10 and 12 per cent.

In considering this statement, however, it must be remembered that fistula in tubercular subjects is common, but this is, of course, quite a different thing from saying that most fistulæ are tubercular. The probable reason why nearly all fistulæ used to be considered tubercular was that fistulæ were found to be very difficult to heal, and the surgeon in attempting to find a reason for his failure concluded that it was because the lesion was tubercular. If tubercle were the commonest cause of fistula, we should expect to find tubercular ulceration of the rectum or anus accompanying it. This is, however, not the case, and, moreover, we find that very few patients with fistula have any signs of tubercle.

One of the commonest causes of fistula is a neglected fissure or ulcer in the anus. I have, on several occasions, seen a typical fissure with a small fistula leading from it, and commencing to track towards the skin. And I have also, on one or two occasions, had the opportunity of observing cases where a patient has come for advice with a painful fissure, and has ceased to attend as soon as the pain was relieved, but some months later has come to see me, and, on examination, I have found a typical fistula, the internal

¹ Paper read before the Hampstead Medical Society.

opening of which was situated at the base of the old fissure.

Foreign bodies, such as fish bones, etc., are often stated to be common causes of fistula, but though such cases are occasionally met with, they do not appear to be common. When a foreign body is found in the fistula, it does not necessarily follow that it has been the cause. One of the commonest causes of fistula is undoubtedly an abscess at the anal margin, or in one of the ischio-rectal fossæ. There are several reasons why abscesses in this situation are common. The anus is surrounded by much loose areolar tissue, which is often, for long periods, subjected to considerable pressure, as we most of us spend many hours a day in a sitting position. Also the skin around the anus does not, in most individuals, receive as much attention as regards cleanliness as most other parts of the body, although it certainly requires it no less, and this, combined with the fact that the skin on this part is liable to slight injuries from sitting upon hard substances and other causes, renders abscess formation common.

There are some points in connection with the anatomical relationship of a fistula, which are most important from the point of view of treatment. It is frequently taught that the commonest arrangement of a fistula is for the external and internal openings to communicate by a track, which passes between the two sphincters as in the diagram. And this is the arrangement usually shown in the illustrations, which we find in books on the subject. This is not, however, the commonest arrangement, and it is fortunate that it is not so. The internal opening is usually situated posteriorly at the muco-cutaneous

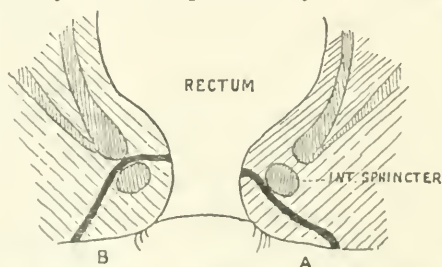


Fig. 1.—Diagram of Rectum showing A, usual relationship of a fistula to the internal sphincter, and B, less usual but commonly described relationship.

junction, but the track, as a rule, does not pass deep to the

external sphincter, but superficial to it. (*See Fig. 1.*)

It is quite obvious that, if the fistula passed deep to the external sphincter, the latter would be divided in laying open the fistula. I have made careful observations of the parts cut in a great many cases, when operating for fistula, and have found that it is quite the exception to find any of the fibres of the sphincter to have been cut. Mr. Rickman Godlee, several years ago, investigated this point in post-mortem subjects with fistula at the Brompton Hospital, and found, as I have stated, that the track of the fistula passes superficial to the external sphincter; and it was he who first drew my attention to this point.

The appearances are often most deceptive, as, when a probe is passed through the fistula, there is a considerable thickness of tissue transfixed by the probe, and it seems as if the external sphincter must be included. The reason for this is that there is a certain amount of inflammatory thickening at the anal margin which causes the deceptive appearance. The successful treatment of a fistula necessitates an operation in practically all cases. There are, of course, exceptions, and I have seen two or three small fistulæ which have healed up without any treatment, but such cases are rare. A few simple fistulæ can also be made to heal by the injection of silver nitrate, but this method is so uncertain that it is hardly worth trying.

Many fistulæ start as an ischio-rectal or perianal abscess, and when we see the case in this stage, the proper treatment is of course to open and drain the abscess at once. A free incision should be made into the abscess with proper antiseptic precautions, and a wet antiseptic compress applied to the parts. Frequent hot baths should be ordered, and care taken to see that the drainage remains free, by lightly packing the wound with gauze after each bath. When an acute abscess exists nothing further should be done, and it is a mistake at this stage to open up side tracks if they exist, or to lay open any communication with the bowel.

If a radical operation is attempted while there is acute inflammation, it will probably result in very extensive cutting of the tissues, and severe mutilation of the parts, and, moreover, healing will be delayed. It is better to warn the patient

that a fistula already exists, or will probably develop, for which an operation will later on be necessary. It will be found that, at the end of a fortnight or three weeks, the abscess has healed, leaving only a small and comparatively simple fistula, which can be treated successfully without the extensive cutting, that would have been necessary if all the tracks had been laid open in the first instance.

Before proceeding to treat any fistula, it is most important to make a careful examination of the rectum, and also of the general condition of the patient. If this is not attended to, serious mistakes may be made. A stricture of the rectum, whether malignant or simple, is not infrequently accompanied by fistula. The fistula is below the stricture, and the latter may easily be missed, if the upper part of the bowel is not examined. One may suspect the presence of a stricture when there are a number of fistulæ, and much discharge, especially if there is also diarrhœa. Also it is important to ascertain if there is any ulceration in the rectum, as this will have an important bearing on the treatment. It is important to investigate the general condition of the patient, as regards especially signs of tubercle, diabetes, and Bright's disease, his suitability as regards the administration of an anæsthetic is also an important point.

Treatment of a Fistula.—It used to be taught that one of the cardinal points in operating for fistula was to divide the sphincter, so as to give rest to the parts. This is a fallacy. It is impossible to give rest to the parts; the anus moves with every respiration, and with every movement of the body, and rest is a practical impossibility, and certainly dividing the sphincter will not secure it. Many patients, I feel certain, have had their power of control seriously damaged, owing to the way in which their sphincters have been cut, as a result of this teaching. The essential factor, for success in operating for fistula, is to establish *free* drainage to the whole of the fistula. The sphincters need not be divided beyond what may be necessary to establish drainage. Provided that there is free drainage to all parts of the fistula, healing will follow, assuming, of course, that the after-treatment is correctly carried out. The important thing is to make certain that all the tracks or branches of the fistula are discovered and opened, and that, in

such a way, that the drainage will not only be free immediately after the operation, but during the whole of the healing process.

Before proceeding to perform the operation, the parts should, of course, be thoroughly cleansed, and, when possible, the interior of the rectum irrigated with an antiseptic. I prefer not to dilate the anus until after the fistulous tracks have been laid open, as there is otherwise a risk of forcing septic material into the healthy tissues.

In the case of a complicated fistula, all the side tracks should be carefully laid open, before proceeding to lay open the track which leads into the bowel. It is most important to make quite certain that *all* side tracks are freely laid open. If the parts are well retracted, and there is a good light, the exposed track of the fistula can be seen, and it is often possible to see the openings of side tracks; these should then

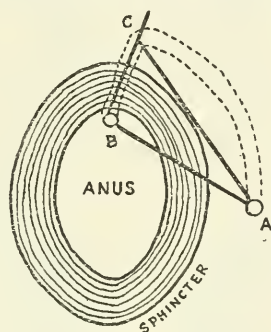


Fig. 2.—Diagram of anus showing the method of dividing a fistula so as not to cut the sphincter obliquely. The dotted lines show the fistula. If a probe is passed from the external opening A through the fistula and out of the internal opening B, and the fistula then divided, the muscle will be cut obliquely as at A, B. The fistula should first be laid open along A, C, and the director then passed through from C to B, the muscle will then be cut at right angles.

be examined with a probe having a fairly big end. If too fine a probe is used, it may be easily pushed into sound tissue, and, in any case, the probe should be handled gently. The best guide for finding side tracks is the educated finger, by means of which such tracks can be felt as indurated places beneath the skin or mucous membrane. In dividing the track which

leads into the bowel, it is most important that the anal margin should not be cut obliquely, but strictly at right angles. Should the sphincter be divided in this cut, it is most important that it should not be cut obliquely, as incontinence may then result, and, even when the sphincter is not involved, an oblique opening into the bowel leaves a wound, which will not heal nicely. In order to prevent the anal margin being divided obliquely, the position of the internal opening should be carefully noted, and the external wound extended in such a way that the probe, when passed through it into the bowel, will lie at right angles to the anal margin. (*See Fig. 2.*)

The whole of the fistulous tracks should next be curretted, and, if there is a lot of dense fibrous tissue around the track of the fistula, this should be cut into with a knife, or in some cases cut away altogether. The edges of the incision and overhanging skin should then be freely cut away, so as to leave free drainage to the whole area. The ideal condition for healing in which the wound should be left, is that of a flat surface or ulcer. This is often impossible, but this ideal should be kept in mind while operating, so as to leave the wound, so far as possible, a flat surface rather than a series of deep channels.

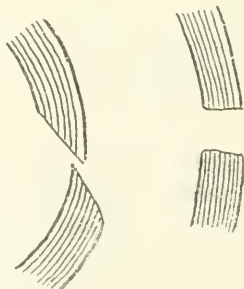


Fig. 3.

Fig. 4.

Fig. 3.—Diagram to show the result of dividing the sphincter obliquely. Good union between the muscle ends will not take place. While in Fig. 4, where the muscle is cut transversely, the union will be good.

Large Horse-shoe Fistula.—When the fistula is in the shape of a horse-shoe, and extends round the sides of the bowel for some way, and has a posterior opening, it is often advisable to do the operation in two stages, and to leave the track passing

into the bowel for the second operation. If the whole fistula is divided at once the posterior part of the anus will retract, as its posterior and lateral connections have been divided, and the result will be a troublesome wound, and considerable deformity of the anus when healing has occurred.

If the side tracks are first laid freely open and allowed to granulate for about a fortnight, and the posterior track passing into the bowel is then divided, the result will be better and healing will be, if anything, quicker.

Cases in which the Internal Opening is high up, or in which there is a Track passing up the Bowel.—These are always difficult cases, and require considerable judgment, as it is

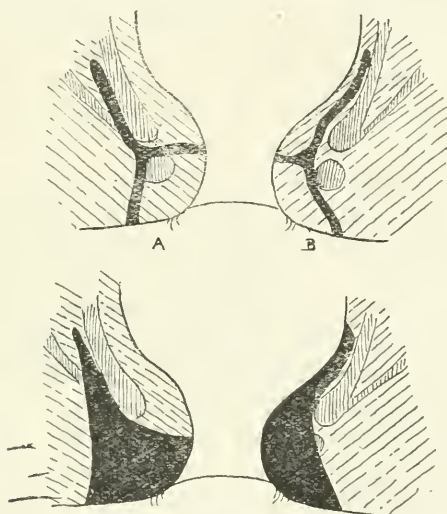


Fig. 5.—Diagram showing high lying fistulous track A, deep to internal sphincter and B superficial to it. The lower diagram shows, by the black areas, the parts which must be incised to secure adequate drainage.

quite easy to do more harm by the operation than the fistula had, or could have, caused. The patient will not be pleased if we cure him of a fistula, and leave him with loss of control over the bowel. Considerable modification of the treatment is here necessary. It is seldom justifiable to divide the internal sphincter, as permanent incontinence is very likely to result. The important thing is to establish free drainage. For this purpose the lower part of the fistula should be freely divided. Then if the higher track runs up

under the mucous membrane and inside the internal sphincter, it should be laid open into the bowel, and, if possible, the edges trimmed off, so as to convert this part of the fistula into a shallow groove in the bowel wall. Such a groove will readily heal, if we have been careful to secure free drainage at the lower end. Before proceeding to cut open such tracks, however, it is necessary to make certain that the hæmorrhage, which is often free, can be adequately controlled; otherwise, in the case of a high-lying track, the surgeon may find himself in an unpleasant predicament.

If the high-lying track lies outside the internal sphincter, it should not be laid open, but it should be widened as much as possible without damage to the internal sphincter, and free drainage established at its lower end (*see* Fig. 5). If it is then carefully dressed, healing usually occurs quite satisfactorily. Fortunately, in most cases where there is a high-lying track, this is sub-mucous.

Treatment of Tubercular Fistula and of Fistula in the Tuberculous.—It is necessary to emphasise the distinction between these two conditions. A patient with phthisis may have a fistula, which is not tuberculous, and by no means are all the fistulæ, met with in tuberculous subjects, due to infection with tubercle. The edges of a tubercular fistula are undermined and thin; the surrounding skin is bluish in colour, and the whole fistula looks callous and unhealthy. The treatment in these cases requires careful consideration. If the patient has well-marked phthisis, the fistula is not causing much pain or discomfort, and there is free drainage, so that the pus is not locked up, it should be left alone until the lung condition has been improved. If, however, the fistula is causing much pain and discomfort, or there is much ulceration and discharge, it should be operated upon, as, besides being a constant source of re-infection, it may seriously interfere with the patient's recovery by the discomfort which it causes. The operation should be done with the object of establishing free drainage, rather than with the object of curing the fistula, and as little cutting as possible should be done.

The question of administering an anæsthetic is a difficulty, and some surgeons advise using local anæsthesia in such cases. Personally, I have never seen any harm result from careful

chloroform anæsthetic, provided that the operation is a short one. Ether is certainly contra-indicated in view of the condition of the lungs. The advisability, or otherwise, of administering a general anæsthetic is a question, however, which should be left to the physician in charge. As soon as possible after the operation, the patient should be got away to fresh country air, and live an out-of-door life, or should go direct to a sanatorium. Great improvement in the condition of the fistula results, but healing is often very slow.

It is important, when operating upon a tubercular fistula, to do so in such a way that there is no danger of causing metastatic tubercular infection, or a general tuberculosis, by setting free tubercular organisms in the tissues at the time of operation. This is particularly important, if, apart from the fistula, the patient is free from tubercular disease. If a tubercular fistula is laid open with a knife and scraped, it may result in a general tubercular infection, which is more serious than the original condition. Some three or four years ago I had a good example of this. The patient was an apparently healthy man, who was suffering from a fistula, which, at the time, I had no reason to suppose was of a tubercular nature. I operated upon him in the ordinary way. About a week after the operation the patient developed swelling and pain in the left knee joint, which gradually, in spite of treatment, got worse. The fistula in the meanwhile healed up, but the condition of the knee became worse, and it was soon evident that he had developed tubercular disease of the knee joint. I think there can be little doubt that, in this case, the fistula was tubercular, and the operation set free organisms which infected the joint. In order to avoid such complications, the fistula should either be laid open with a Paquelin's cautery instead of the knife, or pure carbolic acid should be freely applied to all the raw surfaces after laying open the fistula. In this way any risk of causing a general infection can be avoided.

Diabetes.—In the case of a diabetic suffering from fistula, we must be guided by circumstances. If the fistula is causing much pain and discomfort, and the amount of sugar in the urine is small, and has been stationary for some time, there is no reason why the operation should not be performed. I have several times operated for fistula in such cases, and,

although healing was somewhat slow, the results were quite satisfactory, and there was no increase of the diabetic symptoms.

The Treatment of Fistula by sewing up the Wound.—The ideal treatment of a fistula is, after incising the fistula, to sew up the wound and obtain primary union. It is obvious that if this can be done successfully, many weeks of tedious convalescence may be avoided. It is an operation which requires considerable care, or it will certainly prove unsuccessful. The two essential points to observe, are to completely sterilise the wound before suturing it, and to get every part of it into accurate apposition, by means of the sutures. If a space is left anywhere, the wound will probably break down. In some cases the entire fistula can be excised, and the wound then sewn up. In others the fistulous track is thoroughly scraped, and then sterilised with pure formalin, or carbolic acid before inserting the sutures. The sutures must be inserted through the tissues beneath the wound, and must not pass through it anywhere. When they are tied up the wound should be entirely obliterated. Of course the antiseptic precautions must be very carefully carried out both at the time of the operation, and afterwards.

It is the simple straight fistulæ which are best suited to this method of treatment, and most of the complicated fistulæ cannot be treated in this way.

The After-treatment of Cases of Fistula.—This is in many ways the most important part of the treatment of fistula, and, if not properly carried out, the most careful operation is more than likely to be a failure.

The dressing should be frequently changed. I always let the patient sit in a hot bath containing a little antiseptic twice a day. The dressings soak off in the bath, and the nurse then washes the wound with some weak carbolic, and redresses it. Thus the dressings are changed twice a day, and sometimes oftener, as they are always changed after the bowels have acted. One of the greatest mistakes, commonly made in dressing a fistula, is to plug the wound. This is often energetically carried out, so that every part of the wound is tightly plugged with gauze. There is, I believe, no more

effectual method than this of preventing the wound from healing.

I recently saw a good example of this. The patient was a young man, who consulted me for a fistula, which would not heal. He had been operated upon three times by a doctor in the country, and had been laid up in bed for over six months. On examination, I found a perfectly simple fistula, which had been quite correctly operated upon, and which should have healed in three or four weeks. There seemed no reason for its not having healed, and I suspected that vigorous plugging was the cause of the trouble. Accordingly I kept him in bed, and had the wound very lightly dressed twice daily with a small piece of wool soaked in sterilised olive oil, with the result that the wound was completely healed in less than three weeks.

The wound should never be plugged, but a small flake of sterilised wool should be gently laid in the deeper parts of the wound, so as to prevent premature healing of the more superficial parts. When granulation and healing have commenced, it is important that the delicate new skin at the growing edges should not be damaged, as it easily can be, by the application and removal of the dressing, or by the application of antiseptics. One of the best dressings at this stage is wool soaked in sterilised oil. The oil protects the delicate granulations, and prevents their being damaged when the dressings are removed. If, as is sometimes the case, the wound shows a tendency to stop healing, some stimulating dressing should be applied, such as pure Ichthyol or Friar's balsam, but it should not be applied too frequently. When the wound is nearly healed, I prefer to put no dressing into the wound, but only to apply a pad of wool over the anus, any tendency to bridging being prevented by the application of a probe if necessary. The patient should not be allowed to sit up or walk until the wound is soundly healed. It is often a great temptation, both to the doctor and patient, to allow the latter to get about a little when the wound is nearly healed, but this often results in the wound breaking down again, or refusing to heal further. The reason for this is that the rectal veins have no valves, and consequently, in the erect position, there is considerable pressure, from the effect of gravity, on the column of blood in the large

venous trunks, and this extra pressure, by interfering with the circulation through the tissues of the wound, delays the healing. If the fistula has been sewn up the after-treatment is the same as for any other sutured wound.


Causes for Non-healing of the Wound after an Operation for Fistula.—(1) Inadequate operation. (2) Insufficient drainage. (3) Too tight plugging of the wound. (4) Bridging of the wound. (5) Some constitutional condition of the patient.

A not uncommon cause for the wound refusing to heal, is that some deep track or pocket has been missed at the operation. In such a case, one part of the wound will be found not to heal, and on investigation a deep track will be found opening into this part of the wound. In such circumstances, the only thing to be done is to operate again, and freely lay open the deep track.

Another not uncommon cause is insufficient drainage from the external part of the wound not having been made large enough, so that the outer part of the wound heals up before the deeper part, and the latter, being insufficiently drained, refuses to heal.

Bridging of the wound will also prevent healing. This should be prevented if the wound is properly dressed. Should it occur, the bridge of tissue must be cut through, or broken down with a probe.

Healing is rarely delayed by some constitutional condition of the patient, such as tuberculosis, diabetes, alcoholism, etc. Sometimes, when a fistula refuses to heal, a change to the country or the sea-side will result in rapid improvement, but in the vast majority of cases, in which a fistula wound refuses to heal, the cause is inadequate operation, or improper after-treatment.



ON SOME CONSIDERATIONS INVOLVED
IN THE TREATMENT OF MENTAL DISEASE.

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OF the many and intricate problems which lunacy presents to the medical profession, those which are met with in general practice are different from, and may in some ways be even more puzzling than, those which confront the specialist. The entire absence of any distinct border-line between sanity and madness, the protean forms of the latter with their widely varying prognosis, the importance to the sufferer of early and accurate choice of treatment, the necessity for a refinement of tact and judgment in dealing not only with the patient, but also with his friends—all are difficulties which may face the practitioner with suddenness and insistency.

In dealing with a patient, who has shown signs of mental aberration, the first question which occurs to us is—Is he certifiably insane? While the law safeguards the medical man who, after reasonable care and with due formality signs a certificate of insanity, the document is of such far-reaching importance to the patient, and may engender in him such implacable resentment, that its terms must be carefully searched, as needing to satisfy not only the Commissioners in Lunacy, but also, possibly, twelve laymen in a court of law at some future date. We cannot, with any reasonable regard to our own interests, as well as those of our patient, overlook this consideration. A personal conviction that he is insane must never persuade us to sign a certificate which does not state convincing facts bearing out the opinion, however strong that opinion may be. It is natural and right that the lay public should regard with close scrutiny, if not with suspicion, a legal form which, in careless or unscrupulous hands, might become a menace to the personal freedom of any man. To realise this standpoint is to avoid danger.

Certification is a proceeding designed for the protection both of the afflicted person and of society in general. To

the former it secures protection by the officially acknowledged statement of his mental disability, and also by the supervision of his surroundings, pending the validity of the certificate, by the Commissioners in Lunacy. The benefits afforded to the public are sufficiently obvious.

It must be clearly recognised that, provided a lunatic is under adequate care and control, the law does not compel his certification. Need for this measure may arise from causes existing in the patient himself or in his surroundings. It is obviously not called for in the case of many who show abnormalities of thought or conduct. For instance, the aged often exhibit a certain enfeeblement of memory, inattention to personal cleanliness, and general childishness, which are accepted as being in a measure the attributes of their time of life, and can, in favourable circumstances, be overlooked. But when, as is sometimes the case, such patients acquire habits of aimless wandering, nocturnal restlessness, and noisy behaviour, and total disregard of habits of decency, then necessity for a certificate becomes evident, both in their own interests and in those of others. Again, we are all familiar, in everyday life, with the suspicious person who takes offence at unintended slights, but if such an individual broods over his suspected persecution until nothing short of physical violence will satisfy him, we consider him a fit subject for legal control.

Further, monetary losses, or the inability, from other causes, of relatives or friends to continue efficient supervision, may render certification necessary, apart from any mental change, in a patient who has been adequately tended although uncertified. For proper care, at least of a troublesome patient, can be most economically secured in an asylum.

Thus, when called upon to examine an alleged lunatic, we cannot be justified in withholding a certificate if the facts prove sufficiently cogent.

The modes of treatment available for a mental case, not being of the pauper class, may be grouped under three main headings :—

1. Without certificates, at home or elsewhere.
2. As a voluntary boarder in an asylum.
3. As a certified lunatic in an asylum or in single care.

The number of considerations, which must be weighed and balanced, before one or other method is decided upon, is very large. The monetary position and home environment of the patient may first be dealt with. Means and devotion on the part of relatives may assure safety and expedite cure, while avoiding the stigma of asylum confinement. Poverty or apathy may dictate a different line of treatment. Social status and occupation bear much on the comparative importance to be assigned to the asylum stigma. To a prosperous man of affairs, who is on the brink of retirement from business, it may be of small moment ; a rising professional man, who has competitive posts in view, might find it an insuperable bar to advancement. The resources of the patient may preclude him from enjoying, in his own home, such a measure of attention and control as can be less expensively afforded by a private asylum. Again, we may doubt the enduring will or capacity of his friends to organise and carry through a course of home treatment.

But above all the general type and special features of the case should be carefully pondered. Those varieties of insanity which seem to call imperatively for asylum treatment demand first attention.

Such, obviously, are cases of mania, in which the patient is noisy, violent, and destructive, and cases of noisy melancholia. Even more pressing are those melancholics who have given any hint of suicidal tendency. It is most difficult, in a private house, to eliminate every possible accessory to self-destruction ; in an asylum, all the patient's surroundings are ordered with this view. Especial suspicion should attach to the melancholic, who will talk logically on any subject until, after long and tactful fencing, we elicit his bias to suicide. Such a tendency is often met with, deeply and firmly set, in a patient whose intelligence appears unimpaired, and who, while somewhat quiet and reserved in manner, is capable of busying himself with rational occupations.

The epileptic insane frequently evince aggressive or other anti-social propensities. An epileptic is seldom quite to be trusted, however long he may go without an outbreak, and tragedy has often resulted from neglect of this truism. Most untrustworthy are those victims of *petit mal* who become irresponsible before or after their fits as these lapses are apt

to be marked by acts of dangerous violence. As a general rule, until an epileptic lunatic becomes definitely demented, he is generally safest in asylum care.

Moral insanity of a troublesome type, showing, for instance, a leaning towards eroticism or cruelty, is difficult to treat outside the asylum.

With regard to the disposal of general paralytics there is often small scope for judgment; such patients frequently come under our notice as the result of a mental or moral lapse calling for firm repression. The man with delusions of wealth, who squanders his money recklessly and senselessly, or the megalomaniac who writes to royalty claiming kinship, is no fit subject for home care, and a general paralytic is always liable to develop delusions boding ill to himself or his connections. Such ideas, fleeting and changeable, are difficult to guard against outside an asylum. The risk of self-injury arising from imaginary superhuman strength, of sexual excesses, and of exposure to public ridicule in numberless ways must not be lost sight of. We must remember, however, that, especially among the educated classes, depression and not exaltation may be the dominant psychical feature of the earlier stages, which in even more instances are marked only by progressive dementia. But, in all cases, the general paralytic, like the epileptic, is safest in asylum care, at any rate until dementia has become pronounced.

Paranoiacs form one of the most troublesome, untrustworthy, and dangerous classes of the insane. Not only is it often difficult to obtain definite evidence of a fixed delusion, but it may be still more so to forecast the lines of thought and action along which the delusion will lead. These lines must be made an object of the most careful examination. Fixed ideas of persecution, especially by some particular person or persons, are seldom amenable to home treatment. It is often a matter of great difficulty to convince the friends of a paranoiac how perilous his delusion may become, so impressed are they with the acuteness of his reasoning power, and the correctness of his mental attitude towards all other questions. If we have any suspicion that a paranoiac is, or may become, dangerous to himself or others, we should strongly urge his being sent to an asylum. The same advice naturally holds good in the paranoid form of dementia præcox.

Obsessions may occasionally lead a patient into trouble, though they are generally of a harmless nature. Such cases, however, call for close investigation before advice is given.

The puerperal and lactational forms of insanity are best treated in the asylum, so great is the risk of aggression or suicide.

The system of voluntary boarders in asylums was legalised by the Lunacy Acts of 1853 and 1862, in the case of persons who had already been patients under certificates. The latter restriction was removed by the Acts of 1889 and 1891. In this way a person, desirous of voluntarily submitting to treatment, may, with the consent of the Commissioners, or, where the house is licensed by justices, of two of the justices, be admitted as a boarder to an asylum for a definite time, which may later be extended by similar consent. Such a boarder may of his own accord leave the asylum at any time by giving twenty-four hours' notice. The system has worked well, and its benefits are obvious in the case of patients who doubt their powers of self-control, or who are anxious to further the cure of a disability which they are capable of recognising.

We may now consider the class of patient suitable for treatment under certificates in single care. By the Act of 1890, one certified person may be received into a private house, and a second, if the Commissioners are satisfied that the original patient will be benefited by the association. This method, provided that sufficient means are at our disposal, is capable of somewhat extended application. In some cases the question resolves itself into the amount of attention which can be paid for. I have already attempted to outline the cases which are generally unsuitable for single care. Those, for whom it may be recommended, are the harmless and tractable imbecile and idiot, and many cases of dementia, whether senile, organic, or secondary to other forms of insanity. The hebephrenic type of dementia præcox may be included, and perhaps also such cases of epileptic insanity as have shown no tendency to excitement or mischief. Many subacute and chronic maniacs and melancholics are amenable to this method, and sometimes paranoiacs whose delusions are of an inoffensive nature. In connection with any recommendation to single care, the special mental features of the case must be considered with regard to

the amount of attendance and nursing they demand. It may be no easy matter to find for a particular patient a home suitable alike in site, equipment, and management. The most desirable homes are usually to be found with medical men who have had asylum experience.

Lastly, we have to discuss the cases which do not call for certification, and which may be treated at or away from home, as may be advisable. The cardinal aim of psychiatry should be to attack mental disease in its earliest stages, and to stave off, if possible, its more pronounced manifestations. When we succeed in getting a patient sufficiently early, with signs of an impending breakdown which care may avert, the responsibility of advice is great. Such cases should practically always be treated, with kindness and decision, away from home and friends. A stay in the country, preferably in the house of a medical man, who can be responsible for the patient's companionship, recreation, diet, and general mode of life, is generally essential. It is from single care in this form that the greatest benefit is to be expected. The advantage of entire change of scene and surroundings has often much to do with cure, even when certification and asylum control are the means employed. If, then, we are afforded the chance of early enough treatment in any case of psychasthenia, we should strongly counsel the sufferer's removal from home.

The patients for whom home may suffice are the tractable but incurable. Given a suitable environment, many congenital and many demented cases do not call for removal. We should especially insist, however, that excitement or other troublesome propensities may develop in any form of mental disease ; thus, outbreaks of mania are common in the imbecile. Our patient's relatives must be warned that his control may, at any time, call for greater stringency than home or uncertified single care can afford.



ACUTE INFECTIVE OSTEITIS.¹

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I.—SOME SPECIAL FEATURES IN THE ANATOMY OF
YOUNG BONE.

AT birth, the epiphyses of bones are almost entirely cartilaginous, with the exception of those of the lower extremity of the femur, and of the upper extremity of the tibia. The diaphyses, on the other hand, have undergone ossification throughout their length, the centre of ossification appearing about the middle of the shaft, from the fifth to the eighth week of intra-uterine life, and the process extending rapidly towards the two extremities of the bone, while consecutive ossification under the periosteum soon replaces the bone formed in cartilage. At birth, therefore, the long bones consist of an ossified shaft with a cartilaginous epiphysis at each end; centres of ossification appear in these epiphyses at different times. Their rate of growth and time of union to the shaft vary considerably in different bones and different individuals, probably also in different races, and certainly in the two sexes; these processes taking place earlier in females than in males, so that it is impossible to make hard-and-fast statements with accuracy. The following data, however, taken from Testut's *Anatomy*, give at least approximately the period of the appearance of the centres of ossification, and of their union to the shaft.

Bone.	Centre appears.		Joins shaft.
<i>Humerus.</i>			
Upper extremity	Head, 2nd-4th month	These blend a considerable time before	25th-26th year.
	Tuberosities, 2nd or 3rd year		
Lower extremity	Radial head beginning 3rd year	these blend	16th-18th year.
	Trochlea		
	Ext. condyle 12th year		
	Internal condyle, 5th year	-	1 or 2 years later than rest of lower extremity.
<i>Ulna.</i>			
Olecranon	14th-18th year	-	16th-20th year.
Inferior extremity	6th-9th year	-	20th-22nd year in Female. 21st-25th year in Male.

¹ Being part of a thesis presented for the Degree of D.M. (Oxon.).

Radius.

Head	- -	6th year	- - - -	-	16th-20th year.
Inferior extremity		5th year	- - - -	-	20th-21st year.
Lamella for Bicipital Tuberosity	- -	14th-18th year and joins shaft soon afterwards.			

Femur.

Upper extremity	Head, beginning of 2nd year	-	-	17th-19th year.
	Great Trochanter, 3rd year	}	-	16th-18th year.
	Less Trochanter, 8th year			
Lower extremity,	usually 15 days before birth (but in 7 per cent. cases in 8th foetal month; in 12 per cent. absent at birth—Hartmann)			
		-	-	21st year and later.

Tibia.

Upper extremity,	immediately after birth (some authorities say it shares with the lower extremity of the Femur, the peculiarity of appearing before birth)			18th-20th year or even 24th.
Tuberosity	-	12th-14th year, and joins that of upper extremity a few months later.		
Lower extremity,	2nd year	- - - -	-	16th-18th year.

Fibula.

Upper extremity	4th year	- - - -	-	19th-22nd year.
Lower extremity	2nd year	- - - -	-	18th-19th year.

The development of the *os calcis* and *clavicle* is also of special importance. Among the tarsal bones, each of which is developed by a single centre of ossification, the *os calcis* is peculiar in having also an epiphysis for its posterior extremity; this appears during the seventh, eighth, or even tenth year, and unites with the rest of the bone from the sixteenth to the twentieth year. The *clavicle* has two points of ossification, one for the shaft and outer extremity, which appears at the end of the fourth week (before any other in the skeleton) at the point, which corresponds to the centre of the mature bone; the other, for the inner extremity, appears from the twentieth to the twenty-second year, and consolidates with the shaft from the twenty-third to the twenty-fifth year. The *clavicle* differs from the other limb-bones in that it is only in part preceded by a cartilaginous cast: the bony tissue, which constitutes the former centre of ossification, arises in an indifferent tissue, and develops at once at its expense. Later on, there appear at its inner and outer ends two cartilaginous masses, which, as the bone lengthens, limit its length, and ossify in their turn. This

mode of development is explicable on grounds of its comparative anatomy.—Testut: *Traité d'anatomie humaine*, Vol. I., p. 254 *et seq.*

An examination of these observations discloses the general rule that those epiphyses, in which the centre of ossification appears earliest, are the last to become consolidated to the shaft, while those, in which the centre of ossification appears later, are the first to join the shaft. Consequently the full development of the bones, in the region of the elbow may be completed as early as the sixteenth year, that of the same bones, in the region of the shoulder and wrist, not till the twentieth and twenty-fifth year. In the lower limbs, full development of the bones is completed in the region of the knee, as a rule, in the course of the twentieth year; that of the same bones, at the ankle and hip, during the eighteenth year. The date of consolidation of the upper epiphysis of the fibula to the shaft varies within wide limits, so that, in some cases at least, this general rule would not hold good for this bone. It may, however, be pointed out that the fibula is essentially a splint or spar for the attachment of muscles, tendons, and fasciæ, and not a supporting bone.

Increase in the length of the long bones is effected by the proliferation and multiplication of the cartilage cells on the diaphysial side of the epiphysial cartilage, and by the ossification which follows. The two ends of the bone do not contribute equally to this process, but show a well-marked difference in this respect—a difference which begins at birth and continues during the whole period of growth. The greater growth in length takes place at that epiphysis which is last to join the shaft, but the greater growth at this epiphysis is not due to the delay in junction. After the earlier union has been effected, growth in the length of the bone continues only a short time, and is of insignificant amount. The bones of the upper limb grow most at the ends away from the elbow: those of the lower limb at the ends in the region of the knee, the increase (according to Ollier) being at least four times greater at the lower end of the radius and ulna, and about three times greater at the lower end of the femur (after four years old) than at their respective upper ends. In the tibia, the growth at the upper end does exceed, but

not greatly, that at the lower end.

The Epiphysial or Conjugal Cartilage is the cartilaginous disc left between the centre of ossification in the epiphysis and the bony diaphysis; it is roughly transverse in position, but tends to become cup-shaped to a varying degree. During adolescence, and almost up to the time of union of the epiphysis and diaphysis, it maintains a fairly uniform thickness, and, after this period, becomes ossified, though it *may* be recognised up to an advanced age as an ossified lamina or layer, separating the system of lamellæ of the epiphysis from that of the diaphysis. In longitudinal sections of young bones, this disc is seen in section, and presents the appearance of a narrow band, which is sometimes termed the epiphysial "line." The periphery of it overlaps the end of the diaphysis, and blends with the superficial fibrous layer of the periosteum. On examining, in the London Hospital Museum, a series of specimens of the lower half of the femur, taken from subjects of 3 and 6 months, $1\frac{1}{2}$, 4, 7, 9, 10, 12, 14, 17, 18, 19, 20, and 36 years, the following points called for special notice.

1. There is a well-marked and unmistakable band of congestion on the diaphysial side of the epiphysial cartilage. This is a striking feature in all the specimens up to and including that of 20 years. It is most marked in those of the earlier years—up to 7—and becomes less manifest in the succeeding years. It is about $\frac{1}{10}$ inch broad, most intense next the layer of calcified cartilage, and, traced towards the centre of the diaphysis, gradually gets fainter until it disappears. It is not seen in the 36 years' specimen.

2. The line of cartilage is seen in the specimens up to and including that of 18 years; its site is marked in the 19 and 20 years' specimens by the band of congestion described above. The 36 years' specimen shows no indication of its presence.

3. The deep maroon-red end and uniform colour of the medulla, in the earlier specimens, is in marked contrast with the pale yellowish colour blotched with bright red foci of the later ones, and the series shows well the gradual replacement of the red marrow by yellow. In the earlier specimens, the colour is only a shade lighter than in the same bone taken from a case of pernicious anæmia.

4. The width of the conjugal cartilage appears to be relatively greatest in the 3 and 6 months and 1½ years' specimens, narrower but uniform throughout those of 4, 7, 9, 10, 12 and 14 years, narrowest in those of 17 and 18 years. It cannot be seen at all in those of 19 and 20 years, in both of which, however, its site is marked by the band of congestion described above. There is no sign of it at 36 years.

5. The specimens show well the thickening of the fibrous periosteum opposite the conjugal cartilage.

The importance of the epiphysial cartilage can hardly be overrated, as it is the layer of inception of bone growth for both epiphysis and diaphysis. It is the diaphysial side of the epiphysial cartilage that is physiologically and pathologically so important. The new bone formed on the diaphysial side of this cartilage is extremely vascular, and accordingly we find that the "juxta-epiphysial region" is reddish in colour; owing to structural peculiarities described below, it is also the weakest part of the bone mechanically.

On microscopical examination of longitudinal sections of this region in a long bone, four active or growing layers may be recognised on the diaphysial side of the indifferent cartilage, forming the centre of the epiphysial "cartilage" (or "disc"). The first two of these layers belong to the epiphysial cartilage, the second two to the diaphysis.

1. *Layer of Cartilage Cells in Columns.*—These cells proliferate rapidly, and arrange themselves in columns in the direction of the long axis of the bone. This layer—the actual point of inception of growth—consists of non-vascular cartilage, and inflammatory processes may, therefore, be expected to reach it with difficulty, and the proximity of mechanically weaker layers to protect it from the effects of traumatism.

2. *Layer of calcified cartilage*, the matrix of which is yellow from the deposition of calcareous salts. This layer also is non-vascular.

3. *Layer of osteoclastic cells*, which invade layer No. 2, excavating lacunæ by devouring—as it would seem—the cartilage cells in a straight line up the columns. Thus a system of roughly vertical trabeculæ, separating lacunæ, is formed. In these lacunæ lie capillary loops, and it is owing to the great vascularity of this layer and layer 4, that the band of conges-

tion, on the diaphysial side of the epiphysial line, is recognised macroscopically (*vide supra*). The sharply-defined blind ending of the blood vessels at the diaphysial margin of layer 2 is a striking and characteristic feature of normal growing bone.

Owing to this system of wide lacunæ, separated by slender trabeculæ, this layer is the portion of the bone, which is least able to resist mechanical strain.

4. *Layer of Osteoblasts*.—These “brick in” the tunnels, already excavated, with true bone, laying down bone-lamellæ, in which they bury themselves as “bone-corpuscles.” Thus we get cancellous bone, which (as it recedes from the end of the bone and becomes part of the shaft) is absorbed, and replaced by the compact bone formed by the periosteum.

Macroscopically, these layers may be recognised by their colours. (a) *In perfectly fresh young bones*, the proliferating cartilage (1) is blue, much bluer than the indifferent cartilage above it and bluest on the side next layer 2. Later, when a definite epiphysial disc has been formed, this layer is very much narrower, but presents the same blue colour. The calcified cartilage (2) is of a distinct yellow colour, the young bone or layers of congestion (3) and (4) dark red. These appearances are somewhat modified in (b) *preserved specimens*, in which the proliferating cartilage is bluish-white, and thus distinguishable from the indifferent cartilage above it, which is dead white. The calcified (2) cartilage is yellowish, and the young bone (3) and (4) pink. A bone at the epiphysial cartilage increases simultaneously in width and in length, and it appears that the growth in width, in this region, bears a fixed ratio to the growth in length, for the broadest end of the bone is that at which the greatest increase in length takes place.

The Epiphyses.—Similar but more gradual changes take place on the distal side of the epiphysial disc, and it has been demonstrated that growth on the diaphysial face of the epiphysial disc is fifteen times greater than on the epiphysial face. The epiphyses, when fully formed, resemble short bones in structure, consisting of spongy cancellous tissue in a definite arrangement, surrounded by a thin layer of compact bone. Their blood-supply is independent of that of the diaphyses with the exception of a very few minute arterial

twigs. When an epiphysis is forcibly torn from the diaphysis, the line of cleavage passes through the weak layer of trabeculæ on the diaphysial side of the epiphysial cartilage (*i.e.*, through layers 3 and 4), and the diaphysial aspect presents a raised and pitted surface, which fits on to a corresponding surface on the end of the diaphysis. The epiphysial cartilage thus adheres to the epiphysis proper, and is, consequently, regarded surgically as part of the epiphysis.

The Periosteum consists of two layers.

(1) The outer, superficial, fibrous layer, which resembles a ligament in structure and function. In this layer three points must be emphasised:—

- (a) It is thickened opposite the epiphysial cartilage;
- (b) It is firmly attached to the edges of the epiphysial cartilage, and is therefore an important factor in preventing the spread of inflammation from the diaphysial side to the adjacent joint, since the end of the diaphysis is thus capped by the non-vascular cartilage of the epiphysial disc with the tough fibrous tissue of this layer of the periosteum attached laterally thereto;
- (c) It contributes four-fifths of the mechanical strength of the bone at this region (J. Hutchinson, jun.).

(2) The inner deep layer of soft vascular osteogenetic tissue.

II.—SOME PHENOMENA IN BONE INFLAMMATION.

It is sufficient for our present purpose to notice such features as are peculiar to inflammation in bone, and these are the result of two factors—the physiological and structural peculiarities of bone. To the influence of the former may be ascribed the active bone absorption and bone deposit by osteoclasts and osteoblasts in inflamed areas; these phenomena are most readily recognised in non-infective inflammation. Thus Ollier showed experimentally that, after injury to the diaphysis, owing to the activity of the periosteum, the surface of the bone became rugous from absorption of bone round the Haversian canals, followed by a deposit of new bone. Similarly, if the medulla was injured, the medullary cells proliferated, and bone substance was absorbed in the periphery

of the canal. The effect of such irritation is not limited to the part actually damaged, but extends, with decreasing activity, to adjacent parts.

For the purposes of the present paper, however, the inflammatory phenomena, which depend upon the structural peculiarities of bone, are of still greater importance. Bone may be described as consisting of a hard calcareous mass, the bony laminæ, traversed by a network of channels containing soft tissue, and closely invested by a layer of soft tissue.

It has been found that the hard calcareous substance, though it constitutes the most characteristic feature of bone, is the least important part pathologically, and assumes quite a secondary rôle in the process of inflammation. The laminæ are eroded by osteoclasts stimulated to increased activity, and greater or smaller portions of the bony calcareous substance undergo necrosis during infective inflammation, as the result of thrombosis of the vascular area contained within them, and to a greater extent of the toxic effect of bacterial poisons.

It is, however, the soft parts that take the active primary part in inflammation. These comprise the blood-vessels, lymphatics, nerves, connective tissue, and marrow cells, osteoclasts and osteoblasts and bone cells. The activity of the three latter elements in response to inflammatory irritation has already been noticed, and there remains for discussion the reaction of the blood vessels and connective tissue,—the most important feature of the process. This reaction is in itself essentially similar to that which occurs in other organs, and goes on to suppuration, if virulent micro-organisms have been deposited, but it is in the election of the primary focus of inflammation, and in the spread of the inflammatory changes and suppuration that we see the peculiar importance of the special anatomical arrangement of the vascular and connective tissue distribution. The most vascular portions of bone are the deep or osteo-genetic layer of the periosteum, the marrow and the diaphysial side of the growing epiphysis, and in these parts we find inflammatory phenomena most marked.

All these areas are in direct continuity and intercommunication with each other, as the blood vessels of the periosteum, medulla, and growing end of the diaphysis anastomose with each other in the freest possible manner through the vessels

which traverse the Haversian canals of the compact bone.

We find, in the post-mortem examination of inflamed bones, that when pus is present in the bone marrow, it is also found under the periosteum, and can, in many cases, be traced with the naked eye through the eroded and widened Haversian canals. Similarly, when a focus of suppuration is present in the tissue on the diaphysial side of the epiphysial disc, pus will also be found in the medulla, or beneath the periosteum, or in both places, in the large majority of cases. It is exceedingly rare to find pus confined to the diaphysial side of the epiphysial disc, the medulla, or beneath the periosteum; this close continuity and intimate relationship between the soft parts of a bone make it very difficult to determine the site of the primary inflammatory focus in any given case.

When the inflammation involves the diaphysial extremity, the neighbouring epiphysis may show partial necrosis in the form of small central spongy sequestra. It rarely dies in its entirety, with the exception of the head of femur.

The adjacent joint frequently contains a serous effusion, which is sterile, and generally regarded as the homologue of œdema in the soft parts. Wright has recently adduced evidence to show that such an effusion, as well as those into the pleura, peritoneum, and pericardium, is antibacterial and opsonic in character, and tends to prevent invasion by the micro-organisms. Less commonly the adjacent joint is actually infected, contains pus, and shows the phenomena of acute septic arthritis. This occurs most commonly in the hip-joint, where the epiphysis lies within the joint capsule, and pus can therefore more readily find its way from the vascular area on the diaphysial side of the epiphysial disc into the joint cavity. This was well shown by two cases, included in the present series, in both of which the head-epiphysis was detached from the neck. One showed beautifully the sequence of events; the upper surface of the neck was rough and corrugated, and of a deep maroon colour, with the exception of a triangular brownish-yellow area, and there was a corresponding appearance on the under surface of the epiphysis. When the epiphysis was replaced upon the diaphysis, a pin-sized hole was seen under the edge of the cartilage cap, and

through this the pus had obviously tracked down, stripping off the periosteum, and so made its way into the joint. It had burrowed through the cotyloid notch into the muscles.

In the other, there was an acute suppurative arthritis of the hip-joint, and dislocation by distension on to the dorsum ilii, which bone, with part of the ischium, showed the changes of acute suppurative periostitis.

III.—DISCUSSION OF THE DISEASE BASED UPON A SERIES OF 53 CASES.

A.—IT IS AN ACUTE INFECTION.—The symptoms and physical signs indicate that “acute osteitis” is an acute inflammatory disease. The onset is often sudden, the patient being seized with intense pain in the affected part. The temperature rises rapidly, and, in a few hours, may reach 104° or 105° F. The constitutional disturbance is proportionate to the pyrexia, and the symptoms develop rapidly—shivering, hot dry skin, furred tongue, complete loss of appetite, thirst, sometimes vomiting and constipation. The pulse and respiration rate are accelerated, and the patient soon presents signs of being acutely ill. In addition to the pain in the affected part, there is also extreme tenderness. The part is swollen, the skin over it presents an active hyperæmic blush, feels hot, and is slightly œdematous. These signs are observed, not in the actual region of a joint, but in its vicinity (an important point in the differential diagnosis), or definitely in the length of the bone.

It must be remembered that the disease occurs in varying degrees of severity; the signs and symptoms may be much less marked than in the description given above, or, on the other hand, exaggerated, and the patient obviously in a condition of profound toxæmia.

The invariable presence and range of pyrexia also justify the predicate “acute,” and the following table represents the highest temperatures recorded during the first 24 hours after admission to the hospital in the present series of cases:—

100° F. or under	-	-	3
Between 100° and 101° F.			5
„ 101° „ 102° F.			7

Between 102° and 103° F.	16
„ 103° „ 104° F.	12
„ 104° „ 105° F.	7
105° F. and over -	2 (No note in one case.)

Further, it has long been recognised that the disease is an infection with bacteria, and indeed a review of the literature of the subject shows that almost all the work in connection with it has been done on this aspect of the disease. When once the bacterial nature of the disease had been established, the question arose whether it was specific or not. Reference to the literature shows what divergent opinions were held, and how much work was required to prove, beyond doubt, the non-specificity of these infections.

It has been demonstrated that the majority of the cases are due to *Staphylococcus aureus*, a few to other organisms, though any pyogenic organism may be the cause, and the results are very similar.

The following represents modern views of the bacteriology.

Staph. Albus.—Large doses are required experimentally, the pus is whiter, and the disease tends to be of a milder type.

Staph. Citreus.—Intermediate.

Streptococcus.—Rare as a pure infection, commoner in infancy, and intra-uterine infections. Suppuration takes place earlier, is more diffuse and abundant; the glands are enlarged, the pus of thinner consistency and not greenish, and the resulting necrosis less extensive. If no general septicæmia follows, the cases seem to do better than those due to staphylococci, though joint lesions are more common.

Pneumococcus.—With pneumonia and meningitis, also apart from these, especially in the earlier years of childhood. The general symptoms are often severe at the onset, but the local lesions less severe, as if the virulence was readily exhausted. Lesions of joints are more frequent than those of bones.

Typhoid Bacillus.—It has been shown that, during typhoid, the marrow is congested, and this seems to favour the lodgment of the bacilli; they may lie dormant for years, and have been recovered in pure culture from the marrow after a lapse of seven years. The costo-chondral junctions and the tibiæ are the commonest sites. Mixed infections do occur. The

symptoms are local and insidious, and generally appear in the seventh or eighth week. The pus is yellow and creamy, or brown and syrupy ; most are purely periosteal, but a joint may fill with pus, and recover completely ; necrosis is rare.

Mixed Injections, e.g., Staph. aureus with albus, or with B. coli, or Streptococcus. B. typhosus with B. coli, or Staph. or Strepto.

The cases which occur *after eruptive fevers* (scarlet-fever, measles, small-pox) are due to secondary infection with pyogenic organism.

B.—PREDISPOSING CAUSES.—This factor in the causation of the disease is difficult to investigate with precision. In the present series of cases there was :—

- | | | | | | |
|--|---|---|---|---|----|
| i. A history of antecedent injury alone ; symptoms supervening at varying intervals in the following eight days, with the exception of two cases, in which the injury was received five months and two years before respectively - | - | - | - | - | 14 |
| ii. Sore, through which infection may have taken place, observed on admission or similar focus (<i>e.g.</i> , tonsillitis) found P.M. - | - | - | - | - | 6 |
| iii. History of injury, and sore observed on admission - | - | - | - | - | 3 |
| iv. History of no injury, and no sore ; no sore observed on admission - | - | - | - | - | 2 |
| v. History of no injury - | - | - | - | - | 2 |
| vi. History of injury, and of measles, three weeks before admission - | - | - | - | - | 1 |
| vii. Enteric on admission - | - | - | - | - | 1 |
| viii. No note as to possible predisposing cause - | - | - | - | - | 24 |

In 24 out of the 53 cases, therefore, there is no evidence available, and these must be put aside. In the remaining 29 cases, exclusive of the two in which the injury reported in the history occurred so long before the illness (five months and two years respectively) as to make it extremely doubtful if there can have been any causal connection, *injury* was the only cause suggested in 12 cases, and in four others, was given as one of the possible ætiological factors. *A sore*, through which infection may have taken place, was actually observed

in nine cases, and in three of these, a history of antecedent injury was given.

In two cases, a definite statement was made that no injury had been received. In two other cases, the friends alleged that the patient had received no injury, and had suffered from no sore. As neither patient was suffering from any general infectious disease, these two cases may fairly be considered "spontaneous."

Of the specific fevers, measles and typhoid are found as ætiological factors in two cases.

Two of the cases seem to be definitely related to measles and enteric respectively, and it is well known that periostitis, especially after slight injury, is liable to occur in enteric patients, and less frequently after variola and measles. Considerable increase in height follows some diseases (*e.g.*, enteric) in children, and, according to Ollier, is greater than can be explained by the prolonged assumption of the horizontal position, and consequent diminution of pressure. It is probably due in part to congestion of the medulla of bones with proliferation of the epiphysial cartilage, and Ollier has observed a lessened degree of adhesion of the diaphyses to the epiphysial cartilages in children, dead of eruptive diseases, especially hæmorrhagic small-pox.

Experience, however, teaches that the subjects of acute osteitis are commonly in robust health when they are attacked, and have often been indulging in violent exercise, resulting in fatigue, immediately before the onset of the disease.

The chief predisposing cause then seems to be injury, whilst infected ulcerations of the skin and mucous membranes suggest, in some cases, a source of infection. There are grounds for believing that cold and fatigue act occasionally as predisposing causes, and acute bone-disease is also sometimes found as a complication of the eruptive fevers and general infections.

C.—AGE-INCIDENCE.—An analysis of the 53 cases show that at—

6 months there were	-	-	-	-	4 cases.
1 year	„	„	-	-	4 „
1½ years	„	„	-	-	1 „
2	„	„	-	-	3 „

3	years	there	were	-	-	-	-	4	cases.
4	"	"	"	-	-	-	-	0	"
5	"	"	"	-	-	-	-	2	"
6	"	"	"	-	-	-	-	2	"
7	"	"	"	-	-	-	-	2	"
8	"	"	"	-	-	-	-	3	"
9	"	"	"	-	-	-	-	1	"
10	"	"	"	-	-	-	-	4	"
11	"	"	"	-	-	-	-	4	"
12	"	"	"	-	-	-	-	6	"
13	"	"	"	-	-	-	-	2	"
14	"	"	"	-	-	-	-	2	"
15	"	"	"	-	-	-	-	3	"
16	"	"	"	-	-	-	-	1	"
17	"	"	"	-	-	-	-	1	"

Besides these there were four cases, one at each of the following ages, 23, 30, 37, and 52.

Forty-nine of the present series of 53 cases, therefore, occurred during childhood or adolescence, that is to say, during the years in which active growth in length is taking place in the long bones and before the union of the epiphysis with the shaft.

The four remaining cases occurred between the ages of 23 and 52; of these one, aged 52, had periostitis of the femur, among other complications of typhoid, and can hardly be considered a case of the disease we are discussing; another, aged 37, was a recurrent case; the third, aged 30, recovered in three days, with rest and fomentations. The remaining case, aged 23, appears to have been one of genuine periostitis. The bone affected in this patient was the right tibia, and (*vide* p. 504) the upper epiphysis of the tibia may not unite with the shaft until the age of 24.

The last two cases, however (aged 23 and 30), may be instances of the disease occurring after the union of the epiphysis. All authorities agree that this does happen, but is uncommon, while the disease is most frequent between the ages of 10 and 17 years, and is rare after 20.

It may be pointed out here that active bone formation continues beneath the periosteum, and on the walls of the medullary canal for a long time after the consolidation of

the epiphysis with the shaft.

Almost all the cases then occur during the period of active bone formation, and the vast majority during the growth in length of the bones. There is, consequently, very little room for doubt that the bone is, during its active growth in length, subject to some special weakness or liability to acute inflammation, and further, that the greater the activity, the greater this weakness.

The cause of this may be conveniently discussed under three headings:—

(i) *The actual activity of the tissue* may itself be a cause of weakness. The late Mr. Barnard drew attention to the fact that, in forming bone from cartilage, the tissue is recapitulating, in the course of a few years, the long history of the evolution of compact bone from the primitive cartilage of the ancestral vertebrate—a review, completed in a few years of changes, immense in themselves, which have taken geological epochs for their evolution.

(ii) *The great vascularity on the diaphysial side of the epiphysial cartilage* during active growth has already been described. It is possible that this may predispose this region to inflammation, and this possibility is specially suited to explain thermal injuries. The ends of many of the long bones are subcutaneous, and therefore specially exposed to changes in temperature, and this suggests that the popular belief in the importance of cold, as a causative factor, may have some substratum of truth in it. We know that cold causes contraction of the arterioles, and the diminution of the supply of arterial blood, thus brought about, may reasonably be supposed to lower the vitality of the cells, and so diminish their power of resisting bacterial infection.

(iii) The most important factor of all, however, remains to be considered, and that is *Traumatism*.

It has been pointed out that, while bone is increasing in length, the structure of the tissue on the diaphysial side of the epiphysial cartilage makes the bone in this region especially unable to resist mechanical strain and injury; any violence, therefore, to which the bone is subjected will have its maximum effect on this the weakest part of the bone.

Ollier (1886) was the first to insist that, beside physiological

causes, traumatism plays an important part in determining the site of inflammation in bones.

"Juxta-epiphysial strains" result from movements and falls, which affect this, the weakest part of the bone, least capable of resisting twists, exaggerated compression, or forced movements. These may readily cause crushing, trabecular fractures, separation of the periosteum, or minute hæmorrhages in this region. Such injuries in children may find their expression in some pain and swelling, or even pain alone in the affected part of the bone, which subsides entirely with simple treatment and rest. They may, on the other hand, give rise to one of the most acute diseases which occur in children, and, between these two extremes, it is reasonable to suppose that there exist all degrees of severity. When one reflects how varied and numerous are the injuries, to which long bones are subject during childhood and adolescence, one cannot fail to be impressed with the dangers, to which the predisposed parts of the bones must be constantly exposed, during these periods of life.

The effects of traumatism depend upon the degree of violence employed, and may be divided clinically as follows:—

1. *Great violence*—result is *separation of epiphysis with dislocation*—the analogue of dislocation of a joint in the adult. This injury is more frequent about the time of puberty, from 11 to 18 years, and is generally due to indirect violence. It is six times as common in males as in females, and most frequently occurs at the lower ends of the femur and radius, and at both extremities of the humerus.

2. *Moderate violence*—result is "*para-epiphysial sprain*," i.e., separation of epiphysis without dislocation, and clinically "a sprain of the joint." The importance of such cases depends upon the fact that the region of inception of bone growth (layer No. 1) may be damaged by attrition of the separated surfaces, if the limb is not rested until the fracture has united, and there is a risk of synostosis occurring with subsequent deformity, especially if there is a companion bone, which continues its growth uninterrupted.

3. *Slight violence*—result is "*para-epiphysial strain*"—anatomically trabecular fractures, crushing of small areas of new

bone, and minute hæmorrhages in the osteoblastic and osteoclastic layers.

Such lesions are of the greatest importance, and probably represent the anatomical basis of one form of "growing pains" which may be conveniently divided into two groups.

(a) *Afebrile*, viz., vague pains near the joints after exertion, with tenderness over epiphysal regions. This may disappear after a night in bed, or come and go for a time, and then disappear as the child grows older. Though, in some cases, they may be due to a transient hyperæmia of the zone of physiological hyperæmia, *i.e.*, to growth, in many, they are doubtless due to some such injuries as have been described above.

(b) *Febrile* ("Fièvre de croissance").—These are of all grades of severity and duration, very variable in onset and course. A large number of children complain of them at some time, most commonly about the knee, especially at the time of sudden advance in growth. A certain proportion are, due to subacute rheumatism, but the majority, to such injuries as have been described on the diaphysial side of the epiphysal cartilage.

The rôle played by *comparatively insignificant* injuries in the causation of acute infective bone disease may then be summarised as follows:—During the period of its active growth in length, a bone undergoes an injury of a trivial nature. As a result of this, a small area of new bone (layer 3—4) is damaged, and this damage is accompanied by a minute extravasation of blood, which becomes infected by micro-organisms. If these are virulent, and the protective mechanism breaks down, an acute suppurative inflammation is the inevitable result. Many observers have noticed that acute infective bone disease follows a slight injury more frequently than a severe bone lesion. A reasonable explanation of this is that all severe injuries, but a very small percentage of slight ones, come under the notice of the surgeon.

D.—SEX.—In the present series, there are 32 males and 21 females.

Most authorities give the proportion as 3 males to 1 female, while some place it as high as 5—1.

A possible explanation of the greater incidence of the

disease among males is that boys expose their limbs to sprains and strains much more than girls.

E.—SITE.—In the 53 cases the bones affected, and the primary lesions were as follows:—

Upper end of tibia	-	-	-	14
Lower end of femur	-	-	-	9
Lower end of tibia	-	-	-	8
Shaft of tibia	-	-	-	4
Upper extremity humerus			-	3
Upper extremity femur	-	-	-	2
Upper extremity fibula		-	-	1
Lower extremity fibula	-		-	1
Os calcis	-	-	-	1
Clavicle	-	-	-	1

There was no evidence of the primary focus in the remaining nine cases, in six of which the tibia was affected, and the femur in the remaining three. These figures show that, with only two exceptions, the affected bones were long bones. Now, the long bones are those in which much of the most active growth of the body takes place.

Secondly, the figures show that it is the most active end of any bone, which is most frequently affected, and demonstrate how much more frequently the trouble arises in or near the ends of the bones than in the length of the shaft, the region of the knee being the most often affected. The figures quoted by most writers show the same thing. The apparent infrequency of the upper extremity of the femur in the table is probably in part due to the fact that those cases are registered clinically as "acute arthritis," the epiphysial line being wholly intra-articular, the suppuration thus spreading readily and early into the joint cavity.

Thirdly, the sites most commonly affected are those most liable to injury. Thus the bones about the knee-joint are affected most of all, and, of the two long bones about the ankle, the tibia, which bears almost unaided the weight of the trunk, is affected eight times, the fibula only once.

Finally, the two short bones affected (the os calcis and the clavicle) are remarkable in resembling the long bones in certain anatomical peculiarities. The clavicle resembles the long bones in having a growing area practically confined to the diaphysial

side of a cartilaginous disc, and the os calcis is the only one among the tarsal bones which has an epiphysis.

An examination of the site affected shows that the disease attacks bones, in which growth takes place beneath an epiphysis, that of the two ends of a bone that with the most actively growing epiphysis is more readily affected, and, finally, that the bones attacked are those which are most exposed to injury, especially strains and jars.

These conclusions afford further evidence, that the presence of active growth beneath an epiphysis renders a bone specially weak or vulnerable, and, further, that this weakness is essentially a mechanical weakness.

F.—MODE OF INFECTION.—The disease has been shown to be due to a bacterial infection, whilst in the preceding paragraph evidence has been brought forward to show that injury, and, to a less extent, cold and fatigue are predisposing causes. The question of the actual mode of infection remains to be discussed. In bone inflammations following gross lesions, such as a compound fracture, the method of infection is obvious, and not within the province of this paper, but the disease under discussion appears to be of the nature of a pyæmia, and the method of infection is often extremely obscure.

Now general bacteriology has demonstrated beyond question that micro-organisms can gain entrance into the body, not only through breaches in the skin and mucous membranes, but also through surfaces, in which no lesions can be detected even with the microscope. Corresponding with these modes of entrance of micro-organisms, the cases naturally fall into the following groups :—

- (i) Those in which a source of infection can be detected, viz., infected wounds of skin or mucous membrane.
- (ii) Those in which no source of infection can be detected, even by the most careful examination. These are the cases which have been called “spontaneous.”

When once micro-organisms have gained an entrance into the body, they may become active in any site in one of two ways : either they may, whilst circulating in the blood or lymph stream, settle and become active in a site, the resistance of which has been lowered by activity of growth, injury, or other factors, or combinations of factors which predispose to infection,

or they may settle in some site, and remain there quiescent until some sufficient local or general cause allows of their becoming actively pathogenic.

There is at present little evidence available to enable us to determine the respective importance of these two alternatives. In favour of the former it must be noted that many cases of acute bone inflammation are certainly septicæmic, staphylococci have been recovered in pure culture from the blood, and others, from the clinical standpoint, present many points of resemblance to typhoid—the typical septicæmia—the local bone lesion or lesions occupying quite a subordinate position in the clinical picture. The most valuable evidence, however, is to be found in the observations and experimental work of Recklinghausen and Klebs, Verneuil, Kocher, Gussenbauer, Becker, Bricon, and Rosenbach.

The more recent work of Petrow on “*Gelenktuberculose und Trauma*” also supplies confirmatory evidence.

“Relapsing osteomyelitis” suggests the possibility of the occurrence of the second alternative, which has been called “The Latent Pyæmia.” In this condition it is supposed that micro-organisms remain quiescent, but full of potential vitality, for varying periods of time, perhaps months or even years, and resume their activity when circumstances are favourable. It is, however, impossible to exclude the possibility of a fresh infection having occurred.

Further, it has been demonstrated by Petrow that tubercle bacilli may be present in bone marrow, without giving any clinical or macroscopical evidence of their presence.

G.—OCCURRENCE OF EPIPHYSITIS, PERIOSTITIS, OSTEITIS, AND OSTEOMYELITIS.—The present series comprises all the cases of these four diseases which were admitted into the London Hospital during 18 months. It is customary to discuss them as distinct diseases, though they are sometimes placed in two categories, as in the present series, viz.:—acute epiphysitis on the one hand, and acute periostitis, osteitis, and osteomyelitis on the other. In reviewing the cases, however, it becomes more and more obvious that there is no essential difference between them; the age-incidence is practically identical in the two series, and though there is a curious difference in the sex-incidence (9 males and 13 females with

acute epiphysitis, and 23 males and 8 females with acute periostitis, osteitis, and osteomyelitis), it is difficult to imagine that this is more than accidental. From the clinical side, the symptoms and physical signs present no material differences, and the temperature ranges correspond very closely. Generally speaking, the same bones are attacked, and the mortality is much the same in the two series, viz.:—9 out of 22 cases of epiphysitis, and 13 out of 29 cases of periostitis, osteitis, and osteomyelitis (or 43 per cent. of all cases). The same causes of death, and the same complications, are found in the fatal cases. In the 17 autopsies, there were 10 cases of pyæmia (with infarcts in lungs and kidneys, pericarditis, endocarditis, myocardial and subcutaneous abscesses, multiple and septic arthritis and epiphysitis, and double empyema), 3 of septicæmia, 3 of pericarditis alone, and 1 of thrombosis of portal vein, right ventricle, and pulmonary artery. In 6 cases there was infection of the adjacent joints.

The difficulty of separating these inflammations as distinct entities is shown by the condition found after death. In the post-mortem room, it is found that, when suppuration takes place, pus is rarely found confined to one region of the bone; thus, although a periostitis, may, and does undoubtedly (but rarely) occur, it is extremely uncommon to find pus under the periosteum unless it is also present in the medulla, and conversely to find it in the medulla, and not under the periosteum. It is therefore scarcely ever possible to use the terms epiphysitis, periostitis, osteitis, and osteomyelitis, as if they represented distinct pathological entities.

Further, it may be pointed out that the term "epiphysitis" is an inaccurate description of the disease, to which it is usually applied, because the disease is found on pathological examination to be essentially a lesion of the diaphysial side of the epiphysial cartilage. The term should be confined to a primary inflammation of the epiphysis itself, a condition which is rare as an independent lesion.

Many observers have demonstrated that, in the majority of cases, although the preponderating inflammation is an epiphysitis, osteitis, periostitis, or osteomyelitis, careful investigation will reveal the fact that the original lesion was in each case an inflammatory focus on the diaphysial side of the epiphysial

cartilage. In these cases, the epiphysis can be separated from the diaphysis of the bone (if it is not already separated) by moderate pressure with the hands—this cannot be done in a healthy bone—the line of separation running through the juxta-epiphysial region. The upper surface of the diaphysis and the corresponding surface of the epiphysis show one or more yellow foci of suppuration, often wedge-shaped, with the apex at the centre, while the rest of the surface is deeply congested. There may also be a perforation leading into the neighbouring joint, or peripherally beneath the periosteum indicating the course along which the pus has tracked. The medulla may also be infected.

Finally, German writers have put forward the theory, that the particular form of preponderating inflammation, to which such a focus gives rise, depends upon the position of this focus on the diaphysial side of the epiphysial cartilage. For purposes of description, therefore, the cartilaginous disc may be compared with a target, and these three positions be alluded to as “Bull’s-eye,” “Outer,” and “Magpie,” respectively. When suppuration has taken place in one of these regions, the pus tracks in the direction of least resistance.

The sequence of events is essentially the same in all long bones, but the details are modified by the anatomical peculiarities of each bone. With this reservation, the process may be described as it occurs in the tibia, in which the medullary cavity approaches very closely, and indeed almost touches, the epiphysial discs. The three varieties may, in this bone, be recognised.

1. When the lesion is opposite the centre of the disc (Bull’s-eye), the pus spreads most easily down the lacunæ of the young bone on the diaphysial side of the epiphysial disc, and therefore quickly reaches and infects the medulla.

Clinically, therefore, the case is one of “acute infective osteomyelitis.”

2. If the lesion is intermediate between the centre and edge of the disc (Magpie), it is separated from both medullary cavity and periosteum by a considerable amount of cancellous bone, through which the pus must spread to reach either of these regions. This process takes time, and therefore the suppuration remains apparently localised for three or four

days until the pus, by separating part of the epiphysis from the diaphysis, reaches the medulla or periosteum, when it spreads rapidly. Clinically, this is "epiphysitis," and is characterised by showing a much greater tendency to perforate the epiphysis, and invade the corresponding joint than either "osteomyelitis" or "periostitis." This is explained by the supposition that, being shut in for several days, it has time to vascularise and erode the conjugal cartilage, which is the only barrier to the invasion of the joint in this position.

3. The focus of suppuration may be near the edge of the disc (Outer), and in this case naturally reaches the periosteum most readily in its spread. When once it has reached the subperiosteal region, it spreads rapidly towards the centre of the diaphysis, as it cannot pass towards the joint owing to the firm attachment of the fibrous periosteum to the conjugal cartilage. This is an "acute infective periostitis."

CONCLUSION.

The disease is an acute infection of the nature of a pyæmia, which attacks the bones during the period of their active growth, and especially the diaphysial side of epiphysial cartilages—partly because of the weakness of this juxta-epiphysial region in virtue of its actual growth and vascularity, but to a greater extent, because of its special liability to injury owing to its peculiar mechanical structure during this period. The resulting disease is seldom a pure periostitis, osteitis, or osteomyelitis. In almost every case the primary suppurative lesion is on the diaphysial side of the epiphysial cartilage, and, by its spread, gives rise to preponderating signs and symptoms of one or other of these conditions. The direction of spread depends primarily upon the exact location of the initial abscess on the diaphysial side of the epiphysial cartilage.

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RHINOLOGICAL TREATMENT OF CONSUMPTIVES.

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IN this country very little has been done in the way of routine examination of the nose in consumptives, although, just recently, Dr. Peters¹ has shown himself alive to the possibilities of research in this direction. Abroad, however, to judge from the amount of space given to the subject in Schröder and Blumenfeld's *Therapie der chronischen Lungenschwindsucht*, matters are a little different. It is indeed the case that, although neglected by nearly every text-book, there exists evidence enough to make fairly certain the proposition that non-tuberculous nasal defect, such as septal deformity, atrophic and chronic rhinitis, etc., is much commoner in consumptives than in the normal population. Careful search will show that, nearly every year since the early eighties, someone somewhere has been remarking on various manifestations of this fact, often independently, and as a spontaneous original observation. In a previous paper,² much of this evidence was collated, and deductions from it discussed. Everything would seem to point to the view that impairment of nasal respiration is a common predisposing cause of pulmonary tuberculosis, and that therefore much consumption arises from an aerial infection, with all that that conclusion would mean both scientifically and practically. Is not every consumptive entitled to thorough rhinological examination, and, if necessary, to treatment? It is a question which, as will appear below, has been answered in the affirmative by many previous writers.

Through the kindness of the staff of Mount Vernon Hospital, the writer was enabled to devote a year's practical study to this point. The results appended are for the last six months of that period, and refer to about 300 cases.

A.—CONDITIONS REQUIRING NON-OPERATIVE TREATMENT.

1. *Rhinitis sicca*.—Existing estimates of the frequency of

M M 2

this affection in consumptives are :—

Liaras,³ 13 per cent. ; Freudenthal,⁴ 12 per cent. ; Behr,⁵
12 per cent.

Probably dry rhinitis is included under the heading "rhinitis chronica" frequent in the protocols of Alexander⁶ and Moeller and Rappoport,⁷ since they often note a history of epistaxis. A pupil⁸ of Moure considers that all rhinoscopic appearances in consumptives may be included under the term "coryza pseudo-atrophique tuberculeux," an affection of the nasal mucosa only, characterised by turbinal atrophy (in early lung disease there may be hypertrophy), and little yellowish crusts, especially on the septum. But, to make a short digression, the following evidence that the bony and cartilaginous framework of the nose is also frequently abnormal in consumptives, is clearly adverse to this theory. Septal deformity, which Ducos' own protocols show to have a slight predilection for consumptives, is noted by Moeller and Rappoport, Alexander (l.c.), Payson Clark,⁹ Ingals,¹⁰ Solly,¹¹ and others, as the commonest nasal abnormality amongst them. Post-mortem, Schönemann¹² finds leptorrhinia more commonly by 25 per cent. in consumptives than in the non-tuberculous. Similar work by Minder¹³ led Siebenmann¹⁴ to state that a narrow nose may form part of the *habitus phthisicus*. Further, Jarvis¹⁵ described a high palate as frequent in consumptives, and Talbot,¹⁶ the co-existence of dental irregularity and nasal defect in them, as, too, another writer ; while Bezançon¹⁷ thinks the abnormal shape of the consumptive's chest sometimes due to nasal obstruction. All this cannot be explained on the view of an affection of the nasal mucosa developing shortly before the pulmonary lesion. To return to the cases under notice : in them rhinitis sicca seemed complicated sometimes with adenoids, or the remains of such. Moure¹⁸ says the same of a similar nasal affection or early strumous subjects. The treatment adopted has been to remove adenoids, if any exist, and, if the patient's condition permits, to rest the nose, by periodically closing the nostrils with cottonwool, and to give the well-known local treatment, to be continued after discharge. It is interesting to note that Blumenfeld¹⁹ seeks to explain the liability of diabetics to consumption by the prevalence of dry rhinitis amongst them.

2. *Atrophic intra-nasal conditions* are found by Payson Clark

(l.c.) in 73 per cent. of cases, as against 43 per cent. in the non-tuberculous. Most of the authors named also find a large proportion. Alexander very seldom notes true ozæna, but more often appearances as of a clinically cured ozæna, and frequently some atrophy. Of the present cases only four had fœtor, and one of these was a case of sphenoidal sinus sup-puration; non-fœtid crusting was much commoner. Female consumptives showed the condition more often than male ones, a suggestive fact, in view of the known predilection of ozæna for the female sex. This point, not previously noted, may yet be detected in several records. The importance of treatment is obvious.

3. *Chronic Rhinitis and Post-Nasal Catarrh*.—The frequency of these affections, too, is well attested. Mignon²⁰ says post-nasal catarrh is nearly constant in the tuberculous. Here the Coll. Alkalinum is of great use.

Bicarbonate of Soda	-	-	3 gr.
Borax	-	-	3 gr.
Carbolic Acid	-	-	1 gr.
White sugar	-	-	5 gr.

Water to 1 oz.

4. *Collapsed Nostrils from Long Disuse*.—Three cases were found, to whom Francis' silver wire alæ nasi props were given.

B.—OPERATIVE TREATMENT.

This is, of course, contra-indicated, unless the patient's general condition is good, and the pulmonary disease quiescent. Jarvis (l.c.), a late professor of laryngology in New York in pre-sanatorium days, thinks that it should also be early. So do recently the laryngologists of the Phipps Institute,²¹ whose work is largely among out-patients. With better advantages, more advanced cases may perhaps be treated, provided that their lung condition is quite quiescent. Possibly, there are dangers of setting up local tuberculosis, or of lighting up the lung condition by prolonged general anæsthesia, the latter of which is very seldom needed. No record has been found of either of these mishaps, although a case of the second has been privately reported to the present writer. Blumenfeld has seen no harm follow operative procedures in consumptives' noses, although he had not done resections of deviated septa. The instance,²² in which lupoid disease followed anterior turbinec-tomy in a subject of unsuspected phthisis, cannot be considered

one in point. As to miliary tuberculosis, that might supervene independently, even where surgical treatment had been undertaken. Thus at the Crossley Sanatorium, the writer saw three quiescent cases picked for submucous resection of deviated septum. Two were duly operated on, and did well. The third revoked his consent through timidity, and nothing was done: within a fortnight, he suddenly developed cerebral symptoms and died. Curiously, an almost parallel occurrence took place at Northwood. The chief indication of quiescence here taken is a mouth temperature range, which for two or three weeks does not transgress the limits 97° F. to 98.4° F., when the patient is on moderate exercise. It seems well to avoid operating during menstruation, as there is then nasal turgescence, and also a tendency to pyrexia. Jarvis warns against wounding a nasal mucosa which shows that pale colour common in other parts of the consumptive's upper respiratory tract. This contra-indication is very seldom encountered. There were no bad results, and only occasional and transient rises of temperature.

1. *Adenoids*.—Removal in nineteen cases. Alexander notes these growths in but two per cent. of cases; Roblot,²³ fibrous remains of such fairly often. The percentage here found is certainly higher than the first estimate, even allowing for the fact that, at Northwood, children are admitted in much greater numbers than at most sanatoria. Possibly some of these cases may be like those described by Squire in school children with nasal obstruction, where the pulmonary lesion consisted of areas of atelectasis. Krönig²⁴ imputes to nasal obstruction, generally from adenoids, non-tuberculous right-sided apical "collapse-induration," and others corroborate him. Dundas Grant has expressed himself to a somewhat similar effect. In any case treatment seems essential, with education in nasal breathing.

2. *Septal Deformity*.—Moeller and Rappoport give septal deformity in 37 per cent. of cases. Payson Clark finds marked nasal obstruction from this cause in 16 per cent. of consumptives, but not at all in control cases. Under local anæsthesia, submucous resections were performed in nine cases, and removal of spurs or synechiæ in four.

3. *Affections of the Turbinates*.—Hyperplasia of the inferior turbinate was excised in three cases (all women), and the

galvano-cautery used in seven. In one case, part of the middle urbinatæ was removed.

4. *Nasal Polypi*.—Removal in two cases.

5. *Non-Tuberculous Suppuration of Accessory Sinuses*.—

Of maxillary antrum - - - 2 cases.

Of sphenoidal sinus - - - 1 case.

? Of frontal sinus - - - 1 case.

The figures as to the frequency of non-tuberculous sinus suppuration in phthisis are mostly from post-mortem examinations. They rest on the authority of the following authors:—Harke,²⁵ Fraenkel,²⁶ Lapalle,²⁷ Wertheim,²⁸ Schönemann, Minder (l.c.)—and vary from 32 per cent. to 25 per cent., being on the whole, as some of these authors remark, rather more frequent in consumption than in other disorders, except acute infectious diseases. Clinical results tend to bear this out. Liaras suspects maxillary antrum suppuration in two out of 75 cases diagnosed phthisis, and Alexander in several of his list. The Phipps Institute laryngologists in 198 cases find one with maxillary, and one with frontal, sinusitis. As rhinitis and nasal obstruction, which undoubtedly preponderate in consumptives, are given as causes of accessory sinus trouble, one would expect to find the latter condition also frequently present. There may be another explanation, however. Mackie,²⁹ and also Lack,³⁰ state that suppuration of the maxillary antrum may cause signs and symptoms simulating those of active phthisis, which clear up under local treatment. Perhaps the same condition is more fully described by Du Magny,³¹ according to whom all suppurations of the upper respiratory passages, including otitis media, may exactly mimic signs of pulmonary tubercle from the pus flowing down the bronchi and infecting the lungs, necessarily most severely at the apices. In the cases under notice, two patients with long-standing otitis media showed pus in the corresponding side of the nasopharynx and nose, and had slight apical physical signs with bacilli-free sputum. In one, after removal of an aural polypus, the discharge was cured; but pyrexia continued long afterwards. In the other, there was no reason to think local treatment all important. It was otherwise, however, with regard to the four sinus cases, some of whom possibly had not consumption at all.

(a) C. O., male, æt. 21, had signs of slight generalised

bronchitis, which soon cleared up, and of fibrosis at the left apex. Repeated sputum examination, with and without sedimentation methods, and before and after discharge, proved negative. Blepharitis contra-indicated Calmette's test. He had volunteered no history of nasal trouble, like all these cases, and only, in answer to leading questions, owned to a bilateral purulent discharge for at least a year. He was dark on both sides to transillumination. Left-sided alveolar puncture being negative, adenoids were removed and the nose kept clean. On discharge he went to a special hospital, when pus was found ; but while waiting for admission, when no doubt he neglected nasal irrigation, the cough got worse and he was confined to bed. A heavy extension of physical signs took place, the right side, before and just after operation, being full of moist sounds. The general condition did not at all suggest that tubercle was responsible for this, nor the fact that in a month it had all disappeared, together with the foulness of nasal discharge present at time of operation. Fourteen months after date of discharge from Northwood, the mother writes voluntarily to say that his general health is excellent, his nasal condition and blepharitis much improved, and that he is seeking work.

(b) A. M'G., factory girl, æt. 22. Indefinite physical signs right apex, no sputum, negative to Calmette. Nasal condition at first seemed atrophic rhinitis, but soon double, chiefly right-sided, sphenoidal sinus suppuration was provisionally diagnosed. On being questioned, a history of bad smelling crusts from the nose was disclosed. After discharge, at a special hospital Mr. Parker removed the middle turbinate and broke down the anterior wall of the right sphenoidal sinus with a good result. Fifteen months after discharge from Northwood, in spite of working long hours, patient keeps well, although she coughs a little.

(c) Mrs. N., æt. 33, (prolonged expiration, two right upper lobes—sputum always negative) had had for a year left-sided nasal discharge, a great deal of which she must have been inhaling and swallowing, for the pus went backwards, the septum being so deviated in front towards the affected side that the writer had to resect it before being able to puncture the antrum. Nothing definite in washings, but, at a special hospital, the antrum was opened as a precaution. Eight

months after discharge from Northwood, cough gone, and general health excellent. Persistence of nasal discharge, for which she syringes the nose regularly, makes frontal or ethmoidal sinusitis probable. For this she has not sought advice.

(d) F. A., male, æt. 16, had been a month at an open air institution. Slight signs right apex, sputum repeatedly negative. Usual signs of left maxillary antrum with polypi. Much pus on exploratory puncture and washing out. Mr. Barwell operated on him at St. George's Hospital, and, six months after leaving Northwood, he is at work with no cough, and only mucoid expectoration.

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DIAGNOSIS AND TREATMENT OF GONORRHŒA.

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It is to be deprecated that gonorrhœa should be looked upon as a disease of no moment, for although it may produce no bad effects at the time, it is accountable for many occurring years afterwards, for instance the rôle it plays in the question of sterility. The sequelæ can be reduced to a minimum by proper treatment, and for adequate treatment, the best methods of diagnosis must be at hand.

Symptomatology.—Like all infectious diseases, gonorrhœa has an incubation period, usually from 2 to 4 days, the earlier it appears, the acuter the infection is, and, moreover, it is longer in the second and subsequent attacks.

If the patient is examined early, one finds, several hours after last passing his water, that the urethral orifice contains a greyish white, viscid fluid; the orifice itself being slightly reddened and swollen, and the urine for the most part clear, and very quickly, in the course of a few days, the secretion becomes thicker, of a yellow green colour, appears at the urethral orifice in the morning, and after several hours from the last time of passing water. After urinating, a strong burning sensation occurs right along the urethra. Erections are frequent, especially at night time, often giving excruciating pain. The inflammatory process, which began at the orifice, now extends along the penile portion (*pars pendula*) of the urethra. The secretion retains its thick consistency and its greenish colour, and is occasionally stained blackish from hæmorrhage from the inflamed mucous membrane. The patient now has fever in the evenings, and cannot sleep on account of the painful erections.

At the end of the second week, or at the commencement of the third, the infection has affected the *pars bulbosa*, as far as the bulbo membranaceous junction. Pressure on the perinæum gives pain. At this stage two courses are possible. Either the process remains in the regions aforesaid, a so-

called anterior urethritis, or, and more frequently, it spreads to the pars membranacea and prostatica, a so-called posterior urethritis.

In the first group, the symptoms begin to subside at the end of the third week; the secretion is not so thick and is whiter; the quantity of the discharge is less, and, at the end of the fifth or sixth week, all the subjective symptoms have practically disappeared, except a slight burning sensation on micturition. So long as there is a discharge, the urine appears a little thick, which on standing becomes clear, since the mucus falls to the bottom, and the discharge, on account of the acidity of the urine, appears as threads and flakes, which, when examined microscopically, prove to be epithelial and pus cells.

From this stage, either the cure soon becomes complete, or the patient gets a chronic urethritis.

About three-quarters of all patients affected with acute urethritis get a posterior urethritis, and, in reduced anæmic, cachectic individuals, this may occur spontaneously. The patients suffer from a frequency of micturition which occurs during the daytime, or so long as they are on their feet. This frequency is often accompanied by a tenesmus, a sphincteric spasm, so that the urine comes out in drops on straining. Retention may occur, and finally hæmaturia; the blood appearing with the last drops of urine. The patients complain of a burning and tickling sensation about the rectum.

Diagnosis.—This is obvious when a discharge is seen coming out from the urethra. This discharge stiffens, and also stains the linen, but the pus from a balanitis has a like result, and when the two-glass test is used, which should be carried out in every case in order to ascertain the location of the affection, no mistake can be made. A patient with a discharging balanitis should always draw the foreskin back before urinating, as the pus could give a similar picture to a urethritis acuta anterior.

The finding of the gonococcus is also a positive sign, but, as a rule, this is not necessary unless one is dealing with a chronic case, or a case which has undergone treatment, and the patient wishes to know if he is cured.

The Pappenheim stain (pyronin and methyl green, Unna's modification) is the easiest. Stain for five minutes, wash,

dry ; on examination, the gonococci are stained red, the cells, etc., blue. A Gram's stain is not so easy when one is not continually using it. Leszczinsky's stain, according to its author, is almost specific for gonococci, and the picture it gives is extremely pretty, the contrast making the organisms very easy to diagnose. The film is best made on a cover slip, dried, and stained for one minute in the following solution :—

B. Sol. satur. aq. thionini	-	-	10 pts.
Aq. destill.	-	-	88 „
Acid. carbol. liq.	-	-	2 „

Wash in water, and place in following solution for one minute :—

B. Sol. satur. aq. acid. picric.	-	-	} Æq. partes.
Sol. aq. pot. hydrat. 0·1 per cent.	-	-	

Then absolute alcohol five seconds, quickly dry, mount in balsam, etc. The intracellular cocci are deep black brown, cell nucleus violet rose, and protoplasm clear yellow.

The case should not be diagnosed as positive from the presence alone of extracellular diplococci, because the extracellular life of the gonococcus is a short one, he very soon dies, and even in a Gram negative examination, one cannot be always sure as to whether they are gonococci or no. The intracellular life is peculiar to the gonococcus, inasmuch that he increases in the cell, without any apparent detriment to that cell, instead of being eaten by the cell, as is usual, in other words, he becomes a "saprophyte."

In the examination of threads, do not fish them out of the urine, and spread them on a slide, because, owing to the concentration of the urine due to evaporation, the cells shrink and gonococci cannot be recognised. The best plan is to centrifugate the urine, wash the deposit in water, and re-centrifugate. The threads, with which one meets in the urine, are of two kinds, those containing pus cells, and those consisting of desquamated epithelium, the former, being the heavier, sink quickly to the bottom of the glass. Are these threads diagnostic of gonorrhœa ? Brauser, in 300 cases of people who had never had gonorrhœa, proved the presence of threads in 54 per cent., some of which showed pus cells, such could easily occur as the result of slight irritation, causing an almost negligible amount, while in gonorrhœa,

we usually have to deal with a considerable amount. The finding of gonococci would positive the diagnosis, but unfortunately this does not always succeed, then one is driven to culture, which is often, in old cases, by no means easy, since the gonococci have the power of taking acid from the cell in which they grow, and this acidity prevents them from growing on media. Urine must always be examined fresh, especially if cultures are going to be made, since the gonococci soon die in urine.

Experiments by Stein showed that, with the presence of an albuminous substance on which they can grow, it was possible to cultivate them up to the 12th hour, when no such substance is present, up to the 7th hour from urine.

When a patient is examined, he is told to urinate into two glasses, and for this purpose he must have a nearly full bladder, or, in other words, he should not have passed his water for three or four hours before.

If he is an old case, and is using injections at home, he should be directed not to inject himself for the last 16 hours. If the first glass is thick, the patient has an acute anterior urethritis, should the second glass be thick also, then the posterior portion of the urethra is also affected.

Before going any further, one must just refer quickly to the anatomical conditions. The urethra is divided into *pars pendula*, *pars bulbosa*, *pars membranacea*, and *pars prostatica*. The former two contain cavernous tissue, the latter two muscular tissue, the *pars membranacea* is surrounded by muscular fibres, and contraction of these causes a powerful compression of the part, and it is their contraction which causes the retention in urethritis *acuta posterior*.

Since the *pars pendula* and *pars bulbosa* contain cavernous tissue, and the *pars membranacea* and *pars prostatica* muscular, we can divide the urethra into two portions, a *pars cavernosa*, and a *pars muscularis*, and a urethritis anterior as a urethritis of the *pars cavernosa*, and a urethritis posterior as a urethritis of the *pars muscularis*.

The pus formed in urethritis anterior, having nothing to keep it back, appears at the urethral orifice, and as much of it as remains in the canal will be carried away with the first stream of urine, which will naturally be clouded, while

that which comes after will be clear. But the pus which is produced in the pars muscularis is, on the one side, shut off by the sphincter prostatae internus, and, on the other hand, by the compressor urethral, and so is prevented from appearing at the urethral orifice.

After a several hours' pause in urinating, the quantity of pus may be so great that the small space, in which it is formed, cannot hold it; it consequently goes in the direction of least resistance, which is through the weaker sphincter prostatae internus. The pus enters the bladder, and makes the urine therein thick. If the patient now urinates, both portions will be thick, but the first thicker than the second, since it also contains the pus which is left behind in the urethra. Should the quantity of pus formed not be great, there is no regurgitation, so the second glass may contain quite clear urine; but in these cases the morning urine helps, since, owing to the long wait from urinating, much pus gets formed, and so regurgitation is more likely. One or two points about the morning urine should here be noticed. Pus dissolves in urine owing to the presence of a trace of pepsin, hence, should the urine be first examined in the afternoon, a very wrong idea can be formed. The presence of pepsin also accounts for the loss of the albumin reaction in some cases of nephritis, being present one day and not the next; and also for the quick disappearance of casts. Pus dissolves in the morning urine more quickly than in that passed in the day, in warm than in cold, in acid than in alkali. *Bacillus coli communis* has sometimes the action of dissolving albumin.

In cystitis both urines are usually thick, but the second portion is thicker, since the pus, being produced in the bladder, settles to the bottom. Apart from this, cystitis ought never to be confounded with posterior urethritis (when both do not occur together), since the urine is usually alkaline in cystitis, always acid in posterior urethritis, and, in cystitis, one finds microscopically large quantities of bladder epithelium, and in cystitis, pain in the hollow of the back is so common.

In the diagnosis of acute urethritis posterior, one must always bear in mind that there are two traps into which one might easily fall.

(a) The thickness of the urine may be due to the presence

of phosphates, and will clear up on adding acetic acid. This is very common in the fruit season.

(b) Patients will often not do the two-glass test properly, and, having urinated into one, will pour some of this into the second glass, with the consequence that a man, with only an anterior urethritis, is diagnosed as a posterior by the unwary. A good plan to adopt, when a patient shows you both glasses thick, is to ask him how often he gets up in the night to urinate, as there is frequency of micturition in posterior urethritis and cystitis. If he says that there is no necessity to get up, one must be on the look-out for one of the two conditions mentioned above.

A characteristic picture of Chronic Urethritis is,—morning discharge, sticking together of the lips of the urethral orifice, cloudiness of the urine, or only threads in the same.

One must also bear in mind that there are patients, who, in spite of a slight morning discharge, and threads in the urine, have not got gonorrhœa, but are only suffering from its effects; since, after chronic urethritis, there occurs a collection of flat epithelial cells in the recently diseased areas; these flat epithelial cells desquamate, especially in the morning after strong morning erections; and this may amount to so much as to produce a milky discharge and threads in the urine. The differential diagnosis is easy, since, microscopically, these threads show only flat epithelial cells and no pus cells. On the other hand, there are cases of chronic urethritis which do not give these characteristic signs; since the slight morning discharge, the sticking together of the lips of the urethral orifice, are dependent on disease of the pars pendula, but, if the disease is farther up, the compressor muscle again comes into play, and, in these cases, the only sign we get is threads in the urine.

There is one great difference in acute and chronic gonorrhœa, and that is, that, in acute, the disease is diffuse and spread over the greater part of the urethral mucous membrane; in chronic, the disease affects limited areas.

Chronic urethritis must admit of two stages, one in which one gets a succulent connective tissue hyperplasia accompanied by hyperæmia; swelling of the mucous membrane, catarrhal desquamation of the epithelium, especially affecting the Littre's

glands, in the other, connective tissue, which is covered with an overgrowth of flat epithelial cells.

The first stage might be called subacute urethritis, since the disease is not yet limited to definite areas. It is easy to differentiate between them, since, owing to the catarrh of the mucous membrane in the subacute form, one will find mucus in the urine, and often, in this form, the urine is cloudy, which, in chronic urethritis, is quite clear, and only contains threads. The inflammatory process can spread under the mucous membrane and produce, if it spreads anteriorly, a chronic circumscribed peri-urethritis and cavernitis, if posteriorly, a chronic prostatitis. The differential diagnosis between chronic urethritis anterior superficialis and profunda can be ascertained by examination of the urethra with a Bougie à Boule, or Otis' Urethrometer.

The profunda, which affects the corp. cavernosa, and ultimately produces a stricture, very quickly reduces the elasticity and dilatability of the part of the urethra affected, and such a stricture is usually a broad one, while the superficial form does not show such a diminution. In chronic urethritis posterior, one must also distinguish between the superficial and deep form; the latter we will call urethritis chronica posterior prostatica, and this disease has a symptom complex which is perfectly characteristic, and is called "Sexual Neurasthenica" Spermatorrhœa by micturition and defæcation. Postorrhœa. Pain during ejaculation in the hinder part of the urethra, præcipitous ejaculations, insufficient erections to quite complete impotence, frequent pollutions, and the most various hyper- and para-æsthesiæ in the sexual act. Pressure on the prostate per rectum to produce secretion, which is pressed along the urethra into a watch glass, when examined microscopically, always shows pus cells, and, by the naked eye, flakes are often seen. Endoscope examination shows an enlargement of the Caput Gallinaginis with all the signs of inflammation. Inflammation of the prostate with presence of pus can always be diagnosed when, in the two-glass test, the second glass is thick, and the first clear.

It is well to remember, when an epididymitis occurs, that the urine often becomes quite clear, lasting so till the acute symptoms are over.

The possibility of infection naturally depends on the presence of gonococci, then comes the question, How can we find gonococci in chronic urethritis? Their presence in the threads is inconstant, and, since the finding of them in this way is so laborious, it is not practicable, but since they have been found on several occasions, one can only say that chronic urethritis can be infectious, but is not necessarily so.

Professor Finger lays down the rule, that, so long as pus cells are found, the patient must be considered infectious.

TREATMENT.

The treatment of gonorrhœa is so various that it is really very difficult to know which line to choose, but, owing to the work of Neisser in Breslau, and the Vienna School, since the material is so exceptionally great, a radical and a simple form of treatment has been adopted.

Owing to the ill repute into which injections have fallen, being accused of causing strictures, gonorrhœa has been treated by internal medicamentation only. Stricture can follow injections, but only when too strong solutions are used and the injection is badly performed. More than 200 cases daily, in Finger's clinic, receive injections; after careful examination of the patients, not only those at present under treatment, but several, who have had the same treatment months and years ago, stricture was extremely seldom found. Experiments have been tried by treating the patients with balsams alone, some being more than four weeks under treatment, with the result that the percentage of cures was extremely low, and the majority had to be later treated with injections. This can be readily understood, when it has been found possible to grow gonococci on a santal urine agar, and also from a urine from a patient taking gonosan.

The bactericidal power of balsams is practically nil, and their chief use is in moderating the subjective symptoms. The gonococcus has an effect of causing a turgescence of the material on which it grows, the sudden increase of the affection, after erections, being a proof. On this account, astringents were used for treatment, but only those, such as zinc sulphate, which have a pure astringent action. Owing to the non-bactericidal power of such substances, the cases

remained mostly uncured. Astringents, having some disinfectant action, were next used, such as zinc sulphocarbolium, with much more satisfactory results, but even here many cases remained uncured. After laborious bacteriological experiments, Neisser found that silver had the quickest and surest action in killing the gonococci, and their destruction should be the main point in the treatment adopted.

Various experiments were carried out by Lohnstein, in order to find how deep silver salts worked when injected into the urethra, and he came to the conclusion that the organic silver preparations did not penetrate so deep as the inorganic, especially silver nitrate. He found also that silver nitrate led, after long use, to epithelial growth. Albargin produces no epithelial proliferation, and, in the anterior portion of the urethra, was found to penetrate deep, hence this is a good agent in affections of this part. Protargol had practically no penetrating action. Epithelial proliferation was seldom noticed. Ichthargan had a strong penetrating action, but, when introduced into the posterior portion of the urethra, caused a proliferation of the mucous membrane.

A word might be said regarding prophylaxis. Wearing a condom, washing with soap and water, and urinating immediately after the act are strongly to be recommended. Another method advocated, and practised with great success, is the application into the urethra of some antiseptic, applied in the solid form which soon dissolves, and a drug much in use for this purpose is protargol ; or a protargol glycerine solution is used, and dropped into the urethra after coitus.

The treatment of acute urethritis can be divided in three stages—1. Hygienic, 2. Symptomatic, 3. Local.

Hygienic.—First of all rest. Bed is only necessary in the minority as cases ; active exercises must be strictly forbidden. Alcoholic and effervescing drinks are to be avoided, the patient must drink water and milk.

In those cases in which the patient is accustomed to take much alcohol, he often becomes much worse if it is knocked off altogether ; judgment must therefore be used in allowing him a little well mixed with water. In eating, all condiments should be strongly avoided, as they so often increase the inflammation of the urinary tract, and no food or drink

should be taken too hot. Wearing a suspensory bandage is to be recommended.

Symptomatic.—Pain is our greatest adversary here, and this can always be somewhat diminished by diluting the urine, by making the patient drink milk and water, but, at the same time, this should not be pushed too far, because much fluid will increase the frequency of micturition, which will at the same time irritate the mucous membrane. Decreasing the acidity of the urine is often a great relief, and for this let the patient drink aqua calcis. Owing to the reflex spasm of the compressor muscle, pain in posterior urethritis is often extremely acute. For this nothing is better than warm Sitz baths, since they often relieve the retention. Narcotics may be required; if so, they are best employed as suppositories, belladonna or opium.

Against erections the two following prescriptions are recommended:—

R Monobromat. camph. ʒi.	R Pot. brom. ʒiiss-ʒiv.
divid. in dos. x.	Lupulin.
D. ad caps. amylac.	Camph. āā gr. viij-gr. xxiv.
S. 3-4 daily.	misce f. pulv.
	div. in dos. x.
	D. ad chartam-cerat.
	S. 2-4 daily.

In cases of hæmaturia, give ergotin or liquor ferri sesquichlor., and use morphia subcutim, which, by stopping the spasm, acts as a styptic.

Local.—This aims at the destruction of the organism, and can be done either by internal medicamentation, or by direct application of drugs to the urethra. To internal treatment belong drugs from the resins and balsams, as balsam of copaiba, sandal-wood oil, turpentine, and cubebs.

Of these the second is the best and the drug generally used. The great disadvantage of the balsams is that they upset the stomach, and so frequently produce severe pain and vomiting, and also not infrequently very alarming rashes.

In order to get over this difficulty, sandal-wood oil has been specially prepared, freed from any extraneous substances, and made up in membranous capsules, the membrane of which is not dissolved until the pancreatic juice is reached,

consequently no oil ever gets loose in the stomach. The result of this is that the patient does not suffer from those frequent eructations, or other bad effects which follow its administration when otherwise given. These capsules are called Savaresses' capsules. Another danger of balsams is an irritation of the kidneys, but this is not nearly so common now as heretofore, due to the better preparation of the drugs. An enormous number of drugs, as gonorrhol, gonosan, salo-santal, etc., are on the market, but, in addition to being very expensive, they have not had sufficient trial to warrant their general use. Sodium salicylate, especially in acute posterior urethritis, should invariably be used.

For direct application we have two groups of drugs, the pure antiseptics, as protargol and albargin, and the antiseptic astringents, as silver nitrate, argentamin, ichthargan, etc. The members of the first group are used in the early stages of the disease, while those of the second follow later.

Urethritis Acuta Anterior.—When should injections be started? They should not be begun so long as there is any swelling of the glans, or penis, œdema of præputium with complete or incomplete phimosis, dorsal lymphangitis, blood in the secretion, smart pain on micturition and erections. In short, only an antiphlogistic treatment should be employed so long as the patient complains of subjective symptoms, such as simple Lotio Plumbi, applied as compresses, containing a little opium if necessary, and the internal administration of Cannabis Indica, and tincture or extract of hyoscyamus. This is also the time when sandal-wood oil is best employed. When the subjective symptoms have for the most part disappeared, then use some antiseptic injection, in preference protargol or argonin, beginning with a $\frac{1}{4}$ per cent. solution and rising to 1 per cent. The patient injects himself three times a day, always allowing an interval of 8 hours, and he retains the injection, if protargol, from 10 to 15 minutes, if argonin, only 5 minutes. After a few days of this treatment, the secretion is practically reduced to threads, the urine is clear, and the subjective symptoms are nil. When the threads in the urine have disappeared for several days, gradually stop the treatment. Towards the end of a cure of acute urethritis, one often meets with a little catarrh, which may be nothing, or may

go on to the formation of subacute urethritis. Should this be the case—and it is always due to the presence of gonococci and not to syringing—one gets increase of threads in the urine, in which, when examined microscopically, the organisms can be found. The simple cases, having only a little mucus in the urine, and little or no threads, always disappear after injections of bismuth subnitricum (2 per cent.), well shaken before use, and kept in the urethra 4 minutes, and used twice daily.

A FEW WORDS ON THE TECHNIQUE OF INJECTIONS.

Injections should be given at regular intervals, three times a day, every eighth hour. Before injecting, let the patient urinate, so as to free the urethra as much as possible of any secretion. The whole of the diseased mucous membrane should receive, if possible, the fluid at the same time, and it has been found by experiment that this can be done by always injecting the same quantity; a syringe, which holds from 10 to 12 cc. should be used. Have a conical end to the syringe, close the orifice of the urethra well over its point, and inject very slowly, using not much pressure, but an equal one, and do not stop before the syringe is empty. If the fluid is injected too quickly, and if too much force is used, the muscles come into action, and the whole is ejected. The syringe employed is called the Ockart syringe.

Urethritis Acuta Posterior.—Some of these cases are very bad, and the patient must stop in bed, but, as in acute anterior urethritis, no local treatment is employed till the subjective symptoms have disappeared. Sitz baths, suppositories, etc., must be used and the treatment mentioned above under the heading "Symptomatic." Sodium salicylate is frequently employed till the subjective symptoms are quite over, and always in preference to the use of balsams. Then one should begin local treatment. So long as objective signs of anterior urethritis are present, treatment of the posterior by catheters, etc., should be avoided; and, during this stage, the treatment will be self-injections with protargol or argonin, as described under "Anterior Acute Urethritis." For the local treatment of posterior urethritis, two methods are at hand, (1) Diday's irrigation, (2) Instillation by means of Guyon's or Ultzmann's catheters. The difference between the two lies in the fact

that in the former diluted solutions in greater quantity, while in the latter concentrated solutions in smaller quantity are employed. The former is the milder and is the best to start with. The patient must have a full bladder, having passed only a little urine to clean the urethra. Then pass a soft catheter until urine just begins to come out, the moment this happens, draw it slowly back till none comes. The eye of the catheter is now in the pars prostatica. Inject fluid along the catheter very gently and slowly, withdrawing it while injecting. All the fluid in the pars prostatica goes into the bladder, mixes with the urine therein, and so never touches the walls of the bladder. The solutions employed are protargol, 1-2 per cent., potassium permanganate, '02 per cent., zinc sulphocarbolate and silver nitrate, '2 per cent. Injected every 24 or 48 hours.

Instead of using a catheter, the same action may be carried out by means of Janet's irrigation, which fits into the urethral orifice. Janet's irrigation is best performed by means of Nobl's instrument, but in this case C. should be stopped up by the finger, so that the fluid can go right back into the bladder. Use it every second day. After a few applications of the irrigation method, the secretion gets much less, and one may then employ instillation. This is effected by a metal instrument, made so long as only to reach as far as the pars prostatica, which has a very narrow bore, and is curved. Through this is injected usually silver nitrate, 1 cc. of a $\frac{1}{2}$ -2 per cent. solution.

This treatment is continued until the threads disappear, but one must always be on the look-out for any increase of these, and the presence of mucus; because, if catarrh occurs, it may be due to a slight irritation from the treatment, and will quite disappear if it is suspended for a few days, whilst, on the other hand, the case may be going on into a chronic urethritis.

Although a patient is discharged as cured, he may still have some gonococci pent up, in the glands and follicles, which will light up a new process unless he takes every care. Always, therefore, keep a watch over him for some time, and impress upon him the importance of hygienic treatment, and to come back the moment any threads occur in the urine.

Chronic Urethritis.—In the diffuse catarrhal form, the form we have called subacute urethritis, the treatment of injections, as employed in the acute stage, are to be recommended.

When the catarrh is circumscribed, it is better to use stronger astringents, and, in the anterior chronic urethritis, the patient injects himself with albargin, $\cdot 02$ to $\cdot 1$ per cent., argentamin $\cdot 02$ to $\cdot 1$ per cent., or ichthargan $\cdot 02$ to $\cdot 1$ per cent., just as he used argonin in the acute stage.

If the disease is circumscribed to quite limited areas, as can only be discovered by endoscopic examination, one can treat these locally with caustics, or by the use of cacao bougies. This is practically never necessary, and certainly not feasible in a large out-patient department.

If one wishes to use bougies, the following are the best :—

B. Zinc sulph. Gr. ii.

Cupri. sulph. Gr. i.

Argent. nitras. Gr. $\frac{3}{4}$.

Butyr cacao gelatin albæ q.s.f. supposit. Urethralia minima.

Chronic Posterior Urethritis.—Injections are used which can be either in watery glycerine solution, or in lanolin ointment, applied through Guyon's or Ultzmann's catheter syringes. The best solutions are gradually increasing strengths of from $\cdot 5$ to 2 per cent. argent. nitras., 5 to 25 per cent. cupri. sulphas. In all cases of posterior urethritis, in which injections are used, massage of the prostate beforehand, preferably with a finger P.R. should be employed, it opens up the follicles, drives out the pus, etc., contained in them, and when an injection is used, they act as a sort of sponge, sucking it in.

The moment any signs of irritation occur, the treatment should be stopped for a day or two. It is found from experience that silver nitrate is much better in the fresh cases, while copper sulphate is much better in the later, especially in those very old cases, which have threads in the urine, but which contain no gonococci. Watery solutions are not so strong as glycerine or ointment injections (and to make the lanolin, if employed, capable of use, take 95 parts of lanolin to 5 of olive oil) when drugs of the same strength are used. In cases of advanced chronic urethritis, which resist treatment for a long time, a single injection now and again of resorcin glycerine 25 per cent. in the fresh cases, and of trichloroacetic acid 5 per cent. in the old cases, is often very beneficial.

For those cases, in which the inflammation is submucous,

and complicated by a cavernitis or prostatitis, one uses Otis sound, and for each successive application one of larger calibre is employed. For deeper inflammations this sound is not sufficient since the highest number, which can pass the orifice, will not distend the rest of the urethra, the calibre of which is much greater. It is better to use an instrument, which can be opened up after it has passed the orifice, and such an instrument is the urethrometer. After the instrument has remained in from 20 to 30 minutes, the patient receives a silver or copper instillation by means of Guyon's instrument. This urethrometer is extremely useful, as it detects all early-forming strictures, which are at first soft and dilatable, and through its use these nearly always heal, and the patient does not get a permanent stricture.

For chronic prostatitis (*sexualis neurasthenica*) Winternitz's psychophor is used. This is a closed metal catheter a double courant, through which cold water flows.

I am extremely indebted to Professor Finger for the kindness he has shown me in letting me work in his clinic and making use of his material.



CHRONIC INFANTILE PARALYSIS DIAGNOSED
AS MORBUS COXÆ.

TWO CASES.

By FRANCIS HERNAMAN-JOHNSON, M.B., CH.B., R.N.,

(Retired) Late Surgeon, Royal Naval Hospital, Plymouth.

IN the February number of *THE PRACTITIONER*, Sir William Bennett¹ lays stress upon the importance of investigating local lesions with an open mind, and quotes several instances of false diagnosis, owing to the bias given to the observer's mind by the knowledge of an existing constitutional taint. Arthritis deformans, labelled specific, and treated accordingly, and Syphilis, treated as suppurative Osteomyelitis, are among the cases he has met with in practice.

The publication of this article by Sir William Bennett has made me venture to place on record two cases of chronic infantile palsy, both diagnosed and treated as tubercular disease of the hip.

Sceptics frequently bring against us the reproach that, so far as practical results are concerned, it matters little by what learned name we call a given disease; but in the case of the morbid entities named above (Anterior Poliomyelitis and Morbus Coxæ), both are amenable to treatment. Such treatment is, however, of a diametrically opposite nature in the two conditions—that of the one being summed up in the words, Stimulation and Exercise; that of the other, at least in its pre-operative stage, in the expression, Physiological Rest.

Case I.—O. H., boy, 14; weakness in left lower limb, and pain after exertion; symptoms of eight years' duration. History of one sister having died from pulmonary tuberculosis. This boy was stated by the family physician to be suffering from incipient tubercular disease of the hip, and was ordered rest. He was subsequently, aged 12, examined by a surgical specialist, who advised his admission to a general hospital with a view to operation. After three weeks' stay as an in-patient,

¹ The Relation of Some Constitutional Conditions to Local Lesions, Traumatic and Otherwise.

he was sent home, as "his disease had not sufficiently developed." A prolonged period of rest was prescribed; but as the hip seemed to get no worse, and as the boy was still able to walk short distances, the parents did not rigidly follow this advice. At the time I first saw him, he was doing light jobs in his father's shop.

A. Physical Examination.—The left lower limb showed considerable muscular wasting; the glutei were flattened, and the fold on that side obliterated. Measurements from ant. sup. spine to inner malleolus revealed $1\frac{1}{2}$ inches of actual shortening, and there was compensatory tilting of the pelvis with spinal lordosis.

Movements.—(1. Active.) The general movements of the limb were normal, with two exceptions; (a) the thigh could not be flexed beyond an angle of 45 degrees; (b) some paralysis of the peronei and tibials, causing a tendency to foot-drop. Voluntary movement in the unfatigued limb was painless.

(2. Passive.) Passive movement was free in all directions. Flexion of the thigh to a right angle, with marked abduction and eversion, produced no pain.

B. Symptoms.—Feeling of weakness and incapacity in the limb. Dragging pain at hip on walking more than a few hundred yards. Aching of whole limb at night, preventing sleep. General weakly and anæmic condition.

C. History.—Trouble in leg first noticed about age of three. Supposed by parents to be result of a fall. After a few months, condition did not seem to change much, except that disproportion in length of the two limbs became more accentuated as the boy grew up. As before stated, a tuberculous family history existed, a sister having died of phthisis.

Diagnosis and Treatment.—I excluded hip-disease, on the ground of freedom of movement and absence of pain except after fatigue, and made a provisional diagnosis of Chronic Infantile Paralysis. A shoe with a suitable sole was procured, and I carried out a ten weeks' course of hand massage, mechanical vibration, and stimulation by the Faradic current.

Result.—Left buttock restored almost to size of its fellow, gluteal fold restored. Circumference of thigh muscles increased 2 inches. Patient able to flex thigh to a right angle. No fatigue after a walk of three miles. The treatment was stopped

six months ago. There has been no return of symptoms, and the patient has assumed a generally robust appearance.

Case II.—M. H., girl, 10; weakness and pain in right hip and lower limb generally. One sister suffers from tubercular hip (which has been operated on), and the mother is phthisical. The right femur was fractured at the age of 8; union sound.

When looked at from the point of view of the local condition, it was, if anything, even more plainly *not* a case of tuberculous hip than No. 1. For, together with the absence of pain on movement, there existed an evident paralysis of the extensors of the foot; clearly pointing to a general involvement of the limb through the central nervous system.

(a) *The Fractured Femur.*—One medical man put down the whole of the signs and symptoms as being neither more nor less than sequelæ of this lesion. (The weakness, by the way, had existed for years before the accident.)

(b) *Tubercular Diathesis.*—The family physician had pronounced the disease to be *Morbus Coxæ*, and advised sending the child to the seaside. She went for two months, during which time the limb had salt-water bathing, etc.; but on her return home she was not in the least improved. The existence of undoubted tubercular hip disease in an only sister; of pulmonary phthisis in the mother, and of persistent cough and general feebleness in the little patient herself, were considered sufficient justification for a pronouncement, to which no single local appearance or objective test, other than the wasting of the hip muscles, lent the smallest support.

Treatment.—A bacteriological examination of the child's sputum having yielded a negative result as regards tubercle, I decided to treat the case as one of Chronic Infantile Paralysis combined with serious general debility. A boot with a suitable extension (2 inches) was provided. Stimulation of the muscles with the interrupted current was carried out daily for ten minutes for three months, and, at the same time, the calf muscles were gradually stretched by daily massage. The child always slept with a widely opened window, and received general tonic treatment.

Result.—Patient can now walk long distances without any ill-effects. She is of healthy appearance, and is able to go to school, taking part in all the games of other children. The

buttocks on the two sides are indistinguishable, but there is some permanent paralysis of the extensor muscles of the foot ; not, however, sufficient in extent to cause a visible drooping when the boot is on. The cough has vanished.

It may well appear that he, who could mistake them, must be sadly ignorant of his profession. All the men concerned were, however, of well-recognised ability ; but all were handicapped by a full knowledge of the tuberculous family history. The absence of pain on manipulation might have undeceived them ; but it is probable that, expecting to find it, they asked leading questions—young children being always more or less inclined to give such answers as they see their elders expect.

To sum up :—In cases of general weakness of a lower limb in children, with symptoms referred chiefly to the hip, do not be over-ready to diagnose *Morbus Coxæ*. If possible, conduct the physical examination before hearing anything of the history, either personal or family. If aware of the existence of a tuberculous diathesis, be on your guard.

(1) *Pain*.—Examine for this by (*a*) striking the heel in a direction perpendicular to the leg, the patient lying down and holding the limb out stiffly ; (*b*) jamming together the trochanters with both hands, (*c*) likewise the iliac crests. Next, manipulate the ankle, knee, and hip joints in all directions, at the same time noting any limitation of movement. Apply Thomas' test to detect permanent flexion of the thigh. *Do not ask the child if these things hurt, but watch for wincing or expression of pain in the face.* If all these tests are negative, the presumption against the existence of *Morbus Coxæ* is very strong indeed.

(2) *Paralysis*.—Find out how far voluntary movement can be carried out. Especially look for weakness of the extensors of the foot. A tendency to foot drop without contractures is almost diagnostic of infantile palsy. If retraction of the calf-muscles exists, the evidence is of less value. The application of the Faradic current to the muscles is of use in investigating a case : a feeble or absent response indicating nerve lesion.

(3) *Tumour*.—Remember that where the glutei are markedly flattened, the trochanter may stick out, giving the appearance of a tumour. Careful comparison with the sound side will

reveal the fact that the enlargement is apparent only. In case of doubt, a radiograph should be obtained.

(4) *Symptoms*.—Not till the physical examination has been completed, should symptoms be inquired into. Pain is generally complained of, *but always as the result of exertion*. In some cases of infantile palsy, a walk of 100 yards may cause aching of the limb for hours, often spoiling a night's sleep. The pain, however, is *not acute*, being always described as of an "aching" or "dragging" character; it is not brought on by an accidental knock or jar; and never takes the form of "night starts." The general condition in cases of infantile paralysis is often as bad as, or worse than, in tubercular hip; poor nutrition, bad appetite, and digestive troubles being the rule.

(5) *History*.—Parents nearly always attribute these afflictions of the lower limbs to a fall in infancy or early childhood. Such statements are generally to be regarded as valueless, except in so far as they help to fix the date when the disease was first noticed. A history of extreme chronicity, five to ten years without much alteration in the condition, is strongly against the existence of tubercular disease.

In conclusion, a word as to treatment. That of *Morbus Coxæ* I need not discuss; but the therapeutics of infantile paralysis, first seen in its chronic stage, leave, I fear, much to be desired, at least in general practice. For this, text-books are partly to blame, as they take for the most part an unduly pessimistic view of such cases. My experience is that much may be done even after the lapse of many years. Massage and electrical stimulation will often work wonders in a few weeks. The interrupted current, which is easily handled, and involves no complicated apparatus, is, fortunately, the form of electricity of greatest use in just those cases which are most amenable to treatment. Adhesions should, of course, be broken down where possible, if necessary under an anæsthetic; and it is of prime importance that the patient should wear a suitable boot.

THE OPERATIVE TECHNIQUE OF A GENERAL PRACTITIONER.

By A. J. FAIRLIE CLARKE, M.A., M.B., M.C., F.R.C.S.,

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DURING the last two years, since I left hospital and began work as a general practitioner, my aim has been to devise a system of technique for surgical operations, which was at once thorough, and yet sufficiently simple for use in cottages, or in our Cottage Hospital. The following paragraphs give an account of a system which is simple, and the whole of which can be carried out by four, or at the most five, people. In the larger hospitals there is no lack of assistance not only for the operator but also for the anæsthetist, and theatre and ward sisters, but in the cottage or Cottage Hospital assistance is not to be had, and my aim now is to show how, by definitely allotting their duties beforehand, and by simplifying the details of those duties, a few persons can satisfactorily carry out even elaborate surgical proceedings.

Before writing of the procedure in the operating room, I shall state the way in which the things, needed during the operation, are prepared beforehand.

The gowns, towels, dressings, and bandages are placed in a drum, sterilised in a high-pressure steam steriliser, and then the drum is closed, wrapped in brown paper and sealed. The drum is then ready to be opened when the time for the operation comes. Before the steam steriliser was available, the gowns were not sterilised, and so could not be touched by the cleansed hands during the operation, or brought into contact with sterilised objects. The towels were boiled in a saucepan just so long beforehand to allow them to cool sufficiently to be wrung out by the operator himself when wanted. The dressings were obtained ready sterilised from the makers, and the bandages were not sterilised at all.

Mops, not sponges, are invariably used. These are of the

kind first, so far as I know, described by Pozzi in his work on gynæcology. They consist merely of squares of gauze, one foot across, eight layers thick, the edges being turned in and sewn together. These squares are tacked together at one corner in half dozens so that they can easily be torn apart. One or more half dozens of mops are boiled for an hour or longer in a saucepan, in which they remain till wanted. These are invaluable, as they serve not only as mops, but can be used to pack off part of the abdomen, and, if the case is a dirty one, they can be left in place to act as a drain without being disturbed, while on emergency they form an admirable wound dressing. After use, unless contaminated, they are washed so as to do duty again.

At the Cottage Hospital, the bowls are all placed in a large linen bag and boiled in a tin cauldron over a gas flame. The kidney dishes have a separate bag of their own. When boiled these bags are taken out and set to drain by the sink. When the operation is about to begin the nurse opens the bag, and the surgeon, with cleansed hands, takes the bowls and arranges them. In private work I have been content with scalded bowls.

Hot and cold boiled water, or saline solution, is used throughout in the bowls. In the hospital, saline is prepared in the way suggested by Mr. Edward Harrison in his helpful little book on *Modern Methods of Surgical Asepsis*. The cauldron in which the bowls are boiled is filled with saline solution (salt, $1\frac{1}{2}$ ozs., water, 1 gallon), and in it is placed a gallon china jug also full of saline with a towel tied over its mouth; the whole is boiled, and then the jug is lifted out by a piece of bandage, previously tied to the handle, and left long enough to hang outside the cauldron. Four jugs of saline are prepared in this way if needed; two are prepared early enough to be cold by the time for the operation, and they take some four hours to cool; the other two are to be ready hot. In private practice, Mr. Harrison recommends that the family copper be thoroughly cleansed, and wash-hand jugs of saline be boiled in it in the way just described; I generally use plain boiled water.

“As regards instruments, we endeavour to use few and of

the simplest kind. This diminishes expense, because instruments sterilised by heat soon deteriorate ; also, a number of instruments are apt to be confusing to the surgeon, since he alone handles them." . . . "The surgeon himself takes the required instrument from the tray, uses it, and returns it to the lotion. In its passage to and fro it touches nothing. I myself never lay instruments or sponges upon towels or upon the patient's body." . . . "We always endeavour to finish an operation with the instruments with which we began" . . . "It betokens want of forethought to discover in the midst of an operation that an instrument is wanting, and a want of resource not to be able to make another take its place." . . . This passage from Mr. Lockwood's book on *Aseptic Surgery* might have been written for the practitioner, who is short handed, and has but few tools. My instruments, needles (these in a piece of lint), drainage tubing, safety pins, silk-worm gut, and thread are all wrapped in a cloth which is folded over and pinned, and then dropped like a pudding into the instrument steriliser. Any pot will serve to boil tools thus pudding-fashion. This plan I learned from Mr. Leonard Gamgee, of Birmingham, who also gave me the idea of making use of a household meat dish, which, when the cloth is opened out upon it, forms a capital instrument tray. On this tray the instruments, sutures, ligatures, and drainage tube are arranged, each in its accustomed place. The knives and scissors are not boiled, but are placed for half an hour in 30 per cent. Lysoform in water. A china tooth-brush dish makes a good knife tray.

For ligatures, buried sutures, and intestinal stitching, I use the linen thread¹ of the linen-drafter, of which a large reel can be bought for twopence. This thread, wound on a small bottle, is boiled with the tools, or, what is better, with the mops which are boiled for the longer time. The idea of using linen thread I owe to Professor Barker, who speaks

¹ Sometimes I also use iodine cat-gut which does not reappear as often as do silk or linen threads. The cat-gut is not mentioned in the text as my wish is to keep this as simple as possible. The gut is soaked for a week before use in a solution made of tincture of iodine (B.P.) one part, proof spirit fifteen parts, and can then be kept in this indefinitely.

of its use in his *Notes on the Removal of Thyroid Tumours* in THE PRACTITIONER, for September, 1907. I use one size of thread only, Number 35.

The patient's skin I prepare by Grossich's very simple method.¹ The skin area, exposed at the operation, is thoroughly painted with tincture of iodine. This is done twice, first an hour before the operation, and again immediately before the incision is made. The skin is not to be touched with soap and water, as this renders the epidermis sodden, and the iodine does not penetrate so well as when it is dry. Any shaving needed should be done the day before or done dry.

The hands and forearms of the operator and his assistant are cleansed by scrubbing first with hot water and soap, and then with a spirituous solution of biniodide of mercury (1 in 500), emphasis being laid on the soap and water.

These are the preparations made before the operation ; but the key to using these preparations to the best advantage, when short handed, lies, first, in the surgeon doing all that he can for himself, arranging bowls, mops, towels, and instruments, as well as cutting ligatures, and threading needles ; and next, in allotting beforehand the duties of those assisting, so that each may know what he has to do and when he has to do it. If this is done there will be no talking or bustle during the operation. I follow Mr. Harrison's plan, and write out a scheme of the duties of each person present, letting each learn beforehand what is expected of him or her during the operation. As my technique differs from Mr. Harrison's more thorough plan, I append an abstract of the typed instructions I give to the nurse. The scheme which follows has answered well ; I do not think it perfect, or final, for every surgeon tries to improve his technique as time goes by. But I would commend some such scheme to those who are starting surgical work in private practice, and miss the conveniences of hospital. Though the details of technique will change, the correlation

¹ This method I regard as still upon trial, so far I have been pleased with the results. Just now I am trying a 5 per cent. solution of iodine in methylated spirit instead of the 2½ per cent. B.P. tincture. Grossich uses a 10 per cent solution.

between the surgeon and his assistants will always remain important in any surgical operation.

ABSTRACT OF INSTRUCTIONS GIVEN TO THE NURSE.

Operation in a Private House.

Preparation of the Room.—If the case be an emergency one, no furniture or curtains are to be removed except such as are necessary to give sufficient room and light for the operation.

If the room can be prepared on the day before, it may be turned out, curtains removed, the floor scrubbed, and the walls damp dusted. If the window is overlooked from without, the panes of glass should be smeared with soap to make seeing into the room impossible.

Preparation of the Patient's Skin.—This is to be done as already described.

Preparation of the Patient's Bowels.—Castor oil the morning before day of operation. Food as directed, but water may be drunk right up to the commencement of the anæsthetic.

The nurse is to obtain the following in the house :—

- 3 small tables, to be called A, B, C.
- 1 china meat dish.
- 1 or 2 washhand basins.
- 2 or 4 washhand jugs.
- 1 china egg-cup.
- 1 pudding basin.
- 1 pail or foot-bath.
- Plenty of clean towels.

The surgeon will send the following things before the operation :—

- A saucepan full of mops.
- A steriliser full of instruments.
- A sterilised drum containing :—

Gowns	-	}	In this order.
Towels	-		
Dressings	-		
Bandages	-		
- The operating table.

A box containing—
3 enamelled iron bowls.
Tray for knives.
Bottle of lysoform.
Bottle of biniodide.
Bottle of iodine and brush.
Nail-brush in jar.
Box of soap.
2 mackintoshes.

The tables A, B, C, are to be covered with clean towels and arranged :—

A, at head of table, for anæsthetist.
B, at side of table, for surgeon's tools.
C, in the background, for washhand basins.

The enamelled bowls are to be thoroughly scalded with hot water, and then placed upside down as directed below. Two scalded washhand jugs are to be filled with boiled water, covered with clean cloths and left to cool under table B. Two similar jugs are to be in readiness hot.

Place on table A :—

The pudding basin.
1 folded mackintosh.
1 towel.
The iodine, brush, and egg-cup (this last to act as palate).

Place on table B :—

2 larger iron bowls.
China meat dish.
Knife tray.
Bottle of lysoform.

Place on table C :—

1 washhand basin (2 if space permits).
1 smallest iron bowl.
The biniodide solution.
The nail-brush and soap.
Some clean hand towels.

Place one mackintosh on the operating table before the patient is placed thereon, so as to save subsequent lifting. Place the pail beneath this table.

The way, and this is the main point of this paper, in which those present work together when the operation is about to

begin is set out in the following table :—

TABLE OF THE DUTIES OF FIVE* PERSONS TAKING PART IN OPERATION.

When the Surgeon arrives, Nurse i. will kindly assist the anæsthetist, Nurse ii. the Surgeon.

Anæsthetist.	Nurse i.	Assistant.	Surgeon.	Nurse ii.
Bring in patient. Anæsthesise.	Attend patient. Hold patient if necessary.	Help bring in patient. Wash hands. Take and put on gown. Cleanse hands.	Set out knives and scissors. Inspect arrangements. Help bring in patient. Wash hands. Take and put on gown. Cleanse hands. Take and count mops into bowl on B. Take and arrange instruments. Take and arrange towels. Operate.	Pour biniodide into bowl on C. Bring, open, and close drum. Pour boiled water into bowls on B. Bring and open saucepan. Bring and open steriliser. Bring, open, and close drum. Cleanse hands to assist if wanted.
	Arrange patient's clothing. Arrange mackintoshes. Paint patient's skin with iodine. Arrange patient's bed. Change water in bowls. Open drum for dressings.	Assist.		

* If only four persons are available, the duties of assistant are taken by Nurse ii., or the duties of Nurse ii. taken by the assistant. If an assistant is present, Nurse ii. only cleanses her hands to cut ligatures, and thread needles, when speed is specially important.

NOTES FROM FOREIGN JOURNALS.

ACTUAL METHODS FOR PROMOTING DIURESIS.

Prof. Romberg states that diuresis is almost exclusively employed for the relief of œdema and effusion. It may be increased by improving the circulation, or by acting upon the kidneys. It has been thought possible to improve the circulation by increasing the blood-pressure, but the drugs, which bring about that result, do not always have any effect upon diuresis, besides having their own particular indications. In the improvement of the heart's function great value must be attached to the vascular circulation. It often happens that, after the obstacle in the peripheral circulation has been removed, the disappearance of the œdema begins to take place. Thus ascites obstructs circulation in the lower limbs and in the kidneys, and diuresis is re-established only after removal of the ascites. It is especially the stimulation of the renal function which can be brought into play for the dehydration of the organism. Recourse thereto is made when, in the case of cardiac weakness, tonic treatment of the heart does not yield a sufficient result. Among the new remedies, which concern the kidneys, are placed the substances of the purin series. Their effect only miscarries if the increase of the blood-stream cannot be brought about in consequence of lesion in the renal vessels, especially of the glomeruli. Di-methyl-xanthin, theophyllin, or theocin, is in such a case the most energetic diuretic. This must at first be given in small doses—gr. ii. twice a day—then an increase is made gradually up to gr. iii. three or four times a day. The action of diuretin is less energetic, theobromine only comes after this, and caffeine takes the last place. As to the other diuretics, much inferior in action to the purins, they may be useful, such as the vegetable diuretics—juniper berries, equisetum, asparagus, birch-leaves, etc. Calomel and salicylate of soda have a harmful effect upon the kidneys. Salts and water are little suited for relieving œdema, and it is the same with sugar of milk, recommended by G. Sée in a dose of 100 g. (3iij) *per diem*. Acetate of potash is of more effect, but it should be given in doses of 20–30 g. (3v.—3i.) *per diem*. If the circulation is very hampered, as in cardiac insufficiency, or if a renal affection is present, the purin bodies, especially theocin and diuretin, can be replaced by no other drug. In order that the promotion of diuresis may be able to effect dehydration, too large an amount of water must not be given, but it is useless to go below $1\frac{1}{2}$ –2 litres in 24 hours. As to a dechloridised diet, it is especially useful in the dropsical and uræmic affections of renal origin; it is, however, necessary to avoid going too far in prescribing salt. Romberg was able in some cases of ascites, due to tubercle of the peritoneum, to prove that dechloridised diet has increased the diuresis, and caused the quicker disappearance of the ascites.—(*Münch. Med. Wochenschr.*)

THE PYOCYANASE TREATMENT OF DIPHThERIA.

After relating his experiences, working under Professor Weintraud, in the Municipal Hospital at Wiesbaden, Fackenheim sums up his opinions as follows:—

Pyocyanase is of substantial service as an adjuvant in the treatment of diphtheria. It appears to destroy the bacteria, at the appearance of

their toxin, and thus to prevent the further formation of poisonous matter. This effect is made apparent in the quick subsidence of the throat-symptoms, above all of the bacilli themselves, and in the rapid improvement in the general condition of the patient. Pyocyanase should always be employed in conjunction with serum. Notwithstanding many disappointing experiences with the use of serum, in severe cases of diphtheria, it will still be necessary to remain convinced that, by means of the serum, one of the components, from which the danger itself arises in severe cases of diphtheria, is removed, and there is no reason for denying this action of serum. Whether the hypodermic injection of pyocyanase, already tested by experiment, will therefore lead to the widening of its range of use, perhaps at the expense of serum, the future must teach.—(*Therapeutische Monatshefte*.)

TREATMENT OF TUBERCULOSIS BY CINNAMATE OF SODA.

Paul Rayner and Blusson have investigated the physiological and therapeutical action of cinnamate of soda in tuberculous lesions. The substance is derived from cinnamic acid, itself obtained from balsam of Peru. Recommended by Lauderer, a surgeon of Stuttgart, some years ago in intravenous injections of 25 mg. almost as the specific treatment of pulmonary tuberculosis and of external tuberculosis, the treatment had obtained but little success in France. In Spain it was given a more thorough trial. Herrero, and afterwards Espina, increasing the doses given by Lauderer, and using subcutaneous and intra-muscular injections, showed themselves to be convinced of its use. Rayner using these injections was surprised at the good results he has obtained, especially in tuberculosis of the lungs. He quotes a number of confirmatory observations in which, by use of hypodermic injections at a dose of 10 cg. in 10 cc. of physiological serum and continued for a certain time, he has seen gradually produced in tubercular cases, the return of the appetite, increase of strength, fall of fever, lessening of the wasting, disappearance of the cough, and healing of the lesions. A certain number of these patients were discharged from hospital apparently completely cured. He believes it right to conclude that in cinnamate of soda, employed in the high doses recommended by Sanchez Herrero, we have a remedy which, used in conjunction with strengthening treatment, can be of great and actual service in pulmonary tuberculosis.—(*Académie de Médecine*.)

THE MEDICAL TREATMENT OF PELVIC AFFECTIONS.

Richelot considers that the conscience of the surgeon in the region of gynaecology daily finds itself at issue with two classes of facts, (a) in cases of pelvic affection with threatening lesions, which resist gentle treatment, and in which operation seems to be imperative, there may still be a greater interest, for different reasons—youth of the patient, wish to have children—not to interfere; (b) in the case of "nervous arthritics," not infected, without marked lesions, but who have uterine congestion, dysmenorrhœa, uterine catarrh, bleedings, etc., physicians and surgeons are greatly puzzled. Unjustifiable interference and illusory therapeutics are the two rocks ahead. Now, there are medical methods of treatment prescribed daily, from which patients and physicians do not obtain all that is possible—hot water in particular. There is certainly nothing new

in its use in treatment. But yet, of what value are those injections of two litres of water at 45° C. (113° F.), with which one is usually contented? Enough insistence is not made upon the copiousness, the high temperature, and the method of administration. As to the douche, it appears to be reserved for the neuro-pathologists, and the gynaecologist mistrusts its usefulness in affections localised in the pelvis. Among the various modes of application of hot water, Richelot insists upon these two which can have decisive value: the injection and the douche. But to obtain the best results the first should be of from 80 to 100 litres of water, the vaginal douche of Luxeuil, and the second should be employed in two ways, the general douche and the perigastric douche. A special instillation is necessary. This is the stumbling-block. All the physical agents are concerned; the trouble and the expense, of which they are the cause, make them difficult to obtain. But the difficulty of their use is no reason for allowing their value to be ignored. Treatment by hot water, thus understood, has two great indications corresponding with the two classes of facts noted above. In pelvic infections it brings about complete, unhoped-for resolution; in uterine congestion it creates a new existence for the nervous arthritics, whose pains, discharge, and dysmenorrhœa have resisted everything. With the latter perfectly regular, and invariably successful results must not be expected; but the relief, the feeling of well-being experienced by the patients are nearly constant, very often lasting, or brought back by renewing the treatment. Clinical observations in support of these ideas are quoted.

In cases, in which the relief of pelvic congestion does not occur to as full a degree as desired, the disappearance of the pains attributed to uterine congestion, or to the complete resolution of swellings of the adnexa and of the pelvic exudations, it is still useful for the purpose of clinching the diagnosis, determining the true indications, deciding the amount of interference necessary, and limiting the surgical procedure. In conclusion, in order to obtain from hot water in gynaecological practice the greatest possible benefit, it must not be ordered *à la diable*, as is done too often, but the necessity for abundance, high temperature, and regularity of injection must be insisted upon, and—always when it is possible—to do still more, to apply the method in its entirety and vigorously.—(*Académie de Médecine.*)

A MODIFICATION OF SCHULTZE'S METHOD OF INDUCING RESPIRATION.

Ogata has introduced a variation in this method of inducing respiration in new-born infants. The neck of the child is grasped by one hand and the ankles by the other; the trunk is then arched backwards until the upper part presses against the feet, then it is brought back to the expiratory position. The chilling effect of a strong draught of air is thus avoided.—(*Zentralbl. f. Gynäkol.*)

TURPENTINE IN PUERPERAL INFECTION.

Fabre reports encouraging results from the use of turpentine in the Lyons Maternité. He states that its action—that of an internal non-toxic antiseptic—is always the same, whether the turpentine is taken by the mouth, absorbed through the skin or lungs, given by hypodermic injection, or introduced into the uterus. It has a bactericidal effect upon the strepto-

coccus in particular. It promotes hyperleucocytosis, and raises the opsonic index. Comparatively large doses are well borne. He gives 4 to 10 c.c. (3i.—iiss.) by the mouth and 2 c.c. (℥xxx.) by hypodermic injection. These doses are free from danger, have no unfavourable action upon the kidneys, and have only a slight diuretic effect. In four years, the favourable results in over 200 cases have convinced him of the value of the treatment. He is now using it as a prophylactic, and finds the morbidity materially reduced.—(*L'Obstétrique*.)

THE INFLUENCE OF NORMAL SALINE INFUSION UPON THE ACTION OF CHLOROFORM.

Burkhardt has carried out researches in this subject, and comes to these conclusions:—When an infusion is given shortly before narcosis, the toxic action of chloroform upon the organism can be essentially reduced. This effect is thus explained by virtue of the dilution of the blood, the coefficient of absorption of chloroform in the blood is lower, and the blood-pressure, in consequence of this, falls much less. The vagus also after the dilution remains more sensitive. By previous dilution, the concentration of chloroform, fatal at other times to the organism, can without harm be considerably exceeded. The infusion must be given as shortly as possible before the operation, and must be as copious as possible; the greater the dilution, the more intense the effect. Besides the small decrease in the blood-pressure, owing to a previous infusion, the quick recovery after narcosis is particularly remarkable. The chloroform is more quickly excreted again by the respirations. Then again the troublesome after-effects, like headache and vomiting, are very slight, or are altogether absent.—(*Archiv f. klin.Chirurgie*).

THE RESULTS AFTER USING ANTI-TOXIN, REFINED AND CONCENTRATED BY GIBSON'S METHOD.

Writing on this subject in the *New York Medical Journal*, Wodehouse gives the following conclusions:—

1. In therapeutic use, often 10,000 to 15,000 units of anti-toxin are indicated for one injection. If concentrated to a potency of 1,500 units to 1 c.c., 10 c.c. only are necessary for the latter dose, whereas in using the old form of antitoxin, with a potency of 500 units to 1 c.c., the tissues are necessarily distended three times as much by the injection of 30 c.c.
2. The much smaller size syringe and needle necessary are very potent factors in dealing with neurasthenic, frightened patients, who always see every detail.
3. The systemic affections are markedly reduced.
4. In a hospital, in which both diphtheria and scarlet fever are treated, the early recognition and isolation of scarlet fever or measles, developing in the diphtheria ward, are most important. When refined and concentrated anti-toxin has been used, there is no necessity to retain patients with erythematous rashes under observation for several days, as we know these rashes rarely follow its use, whereas, under the old methods of using the unrefined horse-serum, with its accompanying rashes, the early diagnosis was always doubtful.—(*Therapeutic Gazette*.)

THE ASSOCIATION OF SCARLET FEVER AND MEASLES IN CHILDREN.

Lereboullet points out that the time is past when it was believed, with John Hunter, that "two different fevers cannot exist . . . in the same constitu-

tion." He has had, at the Hôpital des Enfants-Assistés, and at the Hôpital des Enfants-Malades, with Professor Hutinel, the opportunity of observing, in full, many cases in which these two diseases were associated. He groups the cases under three headings:—(1) Measles previous to scarlatina; (2) simultaneous appearance of the two diseases; (3) scarlatina previous to measles at a shorter or longer interval.

(1) When scarlatina appears subsequently to measles, in most cases, the evolution of the two diseases is scarcely affected; each takes its own due course. But the scarlatina appears to be capable of aggravating any complication of measles which may be present. Broncho-pneumonia, which has nearly subsided, may rapidly return in a more serious form, and suppurations may recrudescence. Prognosis is, therefore, worse in some cases, but is not to be considered as constantly so. The more usual event is that the prognosis depends upon the degree of one or other of the diseases, free from all association.

(2) When measles and scarlatina appear at the same time, the mixed eruption may present special characteristics, which occasion some difficulty in diagnosis. Sequelæ may appear due to one or the other affection—otitis and broncho-pneumonia were both noted in one case. It does not seem, however, that the fact of the simultaneous appearance causes any modification in the course of the two diseases.

(3) It is a very different matter when scarlatina precedes measles by an interval of a few days. In that case, development is appreciably modified. The attack of measles becomes very severe, and is quickly complicated by fatal broncho-pneumonia. A child comes into the hospital with a scarlatinal eruption, more or less intense, which fades away as the temperature falls. Three, four, or six days later, the premonitory catarrh of measles appears, followed by the eruption. Very soon afterwards, dyspnoea and the physical signs, together with the high fever, point to the onset of a broncho-pneumonia, which increases rapidly, and proves fatal in two or three days. Sometimes, in addition to the lung-affection, symptoms of a general infection, apparently streptococcic, appear. The autopsy reveals lesions of disseminated broncho-pneumonia. Death does not always occur, but the prognosis is always grave.

When a long interval occurs between the appearance of scarlatina, and that subsequently, of measles, prognosis, as a rule, is much less gloomy. The scarlatina being treated and the throat disinfected, the consequences of the secondary measles are less to be dreaded.


Of the three varieties of association, the gravest is that in which scarlatina only precedes measles by a few days, in other words when infection has occurred simultaneously. On the other hand, a simultaneous eruption or separation by a long interval does not appear directly to influence prognosis. The reason for the particular gravity of the first is believed, by Hutinel and Lereboullet, to lie in the fact that the streptococcus is present in a virulent stage in the mouth, from the beginning of the scarlatina attack, and remains in that condition for some time. It is the effective agent in the production of the greater number of the complications, perhaps even that of the disease itself. The most serious complication of measles is broncho-pneumonia, also of infectious origin. When this occurs in a case of scarlatina, the throat and buccal region being at the time a

virulent streptococcal focus, ample opportunity is afforded for a descending bronchial infection of an intensified degree of virulence. The process, in fine, is a secondary auto-infection, in no way requiring the assistance of any exogenous germs. Disseminated broncho-pneumonia is found, on post-mortem examination, to be the usual cause of death, when scarlatina is followed in a short time by measles.

From these ideas, some practical conclusions may be drawn. Patients should be isolated at the time of admission into hospital. Wards should be provided for doubtful cases. The organisation of the out-patient departments, especially at children's hospitals, should be better arranged. Disinfection of the throat by frequent washing should be enforced upon every suspected child. As soon as the rubeolar eruption appears, the child should be isolated in a special room, more on its own account than to screen others. Treatment for broncho-pneumonia should be instituted before symptoms become marked. The attention of the practitioner, should, in these cases, be on the alert, from the very first, as to the possibility of a secondary broncho-pneumonia rapidly developing.—(*Le Progrès Médical.*)

TREATMENT OF POST-DIPHTHERITIC PARALYSIS WITH ANTITOXIN.

Schneider and Vandeuvre report an interesting case, in which this treatment was adopted with complete success. A young soldier, 22 years of age, was brought into hospital, at Lyons, at the end of June. He was then a complete wreck. At the beginning of May, he had suffered from a severe attack of diphtheria, which was treated with antitoxin with complete success, so far as concerned the local manifestations. Some general weakness remained, but he was reported well by the end of the month. About a fortnight later, paralysis appeared in the mouth, larynx, and nose, and gradually involved the whole body. No albuminuria. Temperature ranged from 96° F. to 97° F. There was generalised atrophy of the muscles. Paraplegia of lower limbs. Swallowing solids was impossible, owing to the extensive involvement of the pharynx. Loss of all reflexes and of the muscle-sense giving rise to ataxia. The case was diagnosed as diphtheritic polyneuritis, rapidly becoming extensive, improperly called diphtheritic pseudo-tabes. A better name would be diphtheritic ataxia, as the ataxic symptoms are clearly marked, inco-ordination of movements, loss of the muscular sense. Romberg's symptom, slight disturbance of accommodation. 40 c.c. of freshly prepared anti-diphtheritic serum were injected immediately after admission. A second dose of equal amount was given on the following day, and, two days later, a third. The patient was fed by œsophageal tube, and by nutrient enemata. The day after the third injection, the patient regained the power of swallowing. Two more injections, each of 20 c.c., were given. The recovery was extremely rapid for, ten days after admission, the patient could walk round his bed without assistance. In the course of another month, he was well set up in strength and condition. The authors point out that, in this case, it is more than difficult to attribute the recovery to a coincidence. The patient was steadily going down-hill when admitted, and the change for the better only took place after administration of the antitoxin.—(*Le Progrès Médical.*)



Reviews of Books.

NOTES ON NEW EDITIONS.

Surgical Applied Anatomy. By SIR FREDERICK TREVES, Bart., G.C.V.O., C.B., LL.D., F.R.C.S., Sergeant Surgeon-in-Ordinary to His Majesty the King; Surgeon-in-Ordinary to H.R.H. the Prince of Wales; Consulting Surgeon to the London Hospital. Pp. 640. London: Cassell & Co., Ltd. 9s.

THE present edition is the fifth, and it has been thoroughly revised and brought up to date by Dr. Arthur Keith, F.R.C.S., Lecturer on Anatomy at the London Hospital. We notice that some of the well-known figures in the text have been re-drawn, and that many have been coloured. More than forty new figures have been introduced into this new edition. The book quite maintains its former excellence, and is one which senior medical students will find to be especially useful, and worthy of careful study, just before final examinations in surgery.

A Manual of Midwifery. By THOMAS WATTS EDEN, M.D., F.R.C.P., Obstetric Physician and Lecturer on Practical Midwifery and Gynæcology at Charing Cross Hospital. Second Edition. London: J. & A. Churchill. 12s. 6d. net.

ON its appearance the first edition of this work rapidly established itself as *the* student's text-book of midwifery, and we welcome this new edition, which, we feel sure, will even enhance its popularity. It contains fifty pages more reading matter than its predecessor, an addition due to the inclusion of one or two subjects—*e.g.*, premature rupture of the membranes—which were omitted in the first edition, as well as to a more extended consideration of such important subjects as Abdominal Palpation, the Puerperium, and Infant Feeding. There are also many new illustrations, conspicuous amongst which are those dealing with normal and contracted pelvis, and a complete set of plates illustrating the application of forceps. We warmly commend this excellent volume to the notice of the student and practitioner.

A Short Practice of Midwifery. By HENRY JELLETT, M.D., etc. London, J. & A. Churchill. 10s. 6d. net.

THAT this book has already reached its fifth edition is a sufficient indication of its usefulness and popularity. In the present edition, the sequence of chapters has been changed, so as to be similar, in point of arrangement, to Dr. Jellett's larger *Manual of Midwifery*. Students and others will, therefore, find that the two books are, so to speak, complementary to each other. The work, as is well known, has been written to give a concise and practical description of the treatment adopted by the Rotunda Hospital. The statistics of the Hospital are given up to date, and form a useful feature of the book. In all, 29,790 cases of labour are analysed. As regards treatment, we notice no important deviations from the previous edition. Eclampsia is still treated on sound conservative lines in spite of the pressure from many Continental authorities to empty the uterus at once in all cases. The patient often runs more risk from the operation than from the disease itself. There is an excellent section

on pubiotomy, and the book has, in every way, been brought up to date, and its value has been increased by the addition of several new illustrations.

Hygiene and Public Health. By B. A. WHITELEGGE, C.B., M.D., D.P.H., Late County Medical Officer for the West Riding of Yorkshire, and G. NEWMAN, M.D., D.P.H., Lecturer on Public Health at St. Bartholomew's Hospital. New and Enlarged Edition. London: Cassell & Co., Ltd.

IN the new edition, this well-known manual retains its former style and appearance, and provides the student with an elementary text-book of great value and trustworthiness, and with a readable and concise summary of the current knowledge concerning public health for the purposes of the health officer in every branch of the public service. This edition has been brought thoroughly up to date by a large number of additional facts and records, including the Interim Report of the Royal Commission on Tuberculosis issued last year, as well as much recent legislation.

The Theory and Practice of Hygiene (Notter & Firth). By Lieut.-Col. R. F. FIRTH, F.R.C.S., R.A.M.C. Pp. 993. London: J. & A. Churchill, 21s. net.

THIS new edition of Notter and Firth's *Hygiene* contains a considerable amount of new matter, is thoroughly up to date, and can be confidently recommended as a trustworthy text-book for the student and the medical officer of health. The book has undergone some re-arrangement, notably in the inclusion of sections on Sanitary Law, dealing with the special matter of each chapter. This seems a logical and convenient method of treating a difficult and dry subject. At the same time, the legal matter is co-ordinated in a separate chapter on Sanitary Administration and Law, recent enactments being introduced into a supplementary chapter. A new chapter on the Disposal of the Dead has been added. The microscopical examination of water sediments receives considerable attention, and the bacteriological examination of water is very fully dealt with. In this connection, we consider that a lactose medium is preferable to a glucose one in the routine examination for *B. Coli*. The chapter on parasites is excellent, and a plate of the chief species of fleas has been included. Infection and infective diseases are likewise very completely discussed. Disinfection again, as might be expected, is dealt with in a comprehensive and instructive manner. Other excellent chapters are on Vital Statistics, and Military and Marine Hygiene. The work is profusely illustrated with coloured and uncoloured plates, figures, diagrams, and plans.

Operations of General Practice. By EDRED M. CORNER, M.A., M.C., M.B., B.Sc., F.R.C.S., Surgeon-in-Charge of Out-Patients at St. Thomas' Hospital, and to the Children's Hospital, Great Ormond Street; and H. IRVING PINCHES, M.A., M.B., B.C., M.R.C.S., L.R.C.P., Clinical Assistant to the Children's Hospital, Great Ormond Street. Second edition; revised and enlarged. Pp. 325 + 12 index, and 179 illustrations. London: Oxford Medical Publications. 15s. net.

THE fact that within a year of its publication a second edition of this book has been required, is sufficient testimony to the need which existed,

and to the way in which the authors of this work have met it. Certain alterations and additions have been made. Notable among the latter are descriptions of the operations for strangulated hernia, of alternative operations for hydrocele and hæmorrhoids, and of spinal analgesia. An appendix, consisting of lists of instruments required for various operations, has also been added, and should prove most useful.

The directions for the performance of the operation for tracheotomy would, we think, be made more complete, and the operation itself easier and safer, if the advisability of fixing the trachea with a sharp hook before incising it were suggested, and we should like to see this instrument added to the list of those required for the operation. We note that, despite its ease, and the satisfactory results obtained from it, the operation for hæmorrhoids by clamp and cautery does not find mention.

The authors attribute great importance to the necessity for careful after-treatment of cases, which have been operated upon for enlarged tonsils adenoids, torticollis, and similar deformities—too much stress can hardly be laid upon this point—were its truth only more generally realised among practitioners, we should hear far less of the uselessness of such operations.

In the treatment of syphilis by injections of preparations of mercury, it is stated that the present treatment is most generally by insoluble injections, but no mention is made of the dangers attending the use of such compounds.

We note also, as misprints, one on page 68, where one right angle surely is only half the required rotation, and the heading of page 293, where "explanation" is printed for "exploration."

A detailed index greatly adds to the value of this book, which should certainly be included in the reference library of every practitioner.

Cataract Extraction. By H. HERBERT, F.R.C.S.; late Lieut.-Colonel, I.M.S.; Professor of Ophthalmic Medicine and Surgery, Grant Medical College, and in charge of the Sir Cowasjee Jehangir Ophthalmic Hospital, Bombay. Pp. 391. London: Baillière, Tindall & Cox. 12s. 6d. net.

THE present work has, to a very considerable extent, grown out of Colonel Herbert's previous little book *The Practical Details of Cataract Extraction*, which was published about eight years ago. This volume embodies an experience of nearly five thousand cataract extractions performed in India, and is undoubtedly a most useful little book, which will be of great service to all ophthalmic surgeons. The chapter dealing with the after-complications of cataract extraction, is exceedingly practical, and such a work as this is very welcome, because it is written by one who has had a wide experience. The book is well written, and profusely illustrated, and the production reflects great credit on the publishers.

Aids to Ophthalmology. By N. BISHOP HARMAN, M.B., F.R.C.S. Fourth Edition. Pp. 165; 79 illustrations. London: Baillière, Tindall & Cox. 2s. 6d. net.

THIS volume of the Aid Series, when under the authorship of Mr. Jonathan Hutchinson, jun., met a reasonable requirement on the part of the student, not as a guide, but as a summary which a candidate, who had attended an eye clinic, could rapidly run through on

the eve of an examination. The enlargement, which it has undergone at the hands of Mr. Harman, has sensibly diminished that assistance without making the book a *vade-mecum*. As might be expected from the author's study of conjunctival affections, the portion dealing with these is the best in the book. We demur to such advice as that given concerning chronic phlyctenular keratitis—"Take the child into hospital." That is very well, but his readers are not all surgeons to hospitals with large numbers of beds, and some of them are possibly expecting to earn their living by the exercise of their training. Gonorrhœal rheumatism is cited as one of "the most important causes of iritis." Would it not be well to warn the reader that it is often the only evidence of systemic gonorrhœa, and is not necessarily associated with the fibrositis to which the term "rheumatism" is applied? Turning to the chapter on refraction, we find some curious information. "The value of the optical combination of the eye is that of a convex lens having a focus of 23 millimetres . . . the value of the eye combination is, therefore, nearly 43 dioptries." Whereas the fact is that the dioptric power is 67 dioptries, being the inverse of its anterior focal length of 15 millimetres.

After that we are quite prepared to hear that the "ophthalmometre" (there is an English word) "is of little or no value in practice," a statement as accurate as that concerning the eyes of fishes, which "serve rather as alarums than as organs of perception," or that in the divergent squint of myopes, "the globes are too long to allow of their turning inwards."

The single erratum acknowledged in the book might receive some companions in "mucous" for mucus, "pealed" for peeled, "puncture" for punctum, "iritic" for iridic, hypopion-iritis, largophthalmia, and so on, while Graddy, not Grady, invented the trachoma forceps, and Maunoir, not Mannoir, the iris scissors.

Such words as "abraded," "cuticularised," "obscurement," and the unnecessary use of the first person singular only irritate the reader. Moreover, how is a patient to lie "prone on his back"? The book needs weeding and pruning.

A Manual of the Practice of Medicine. By FREDERICK TAYLOR, M.D., F.R.C.P., Consulting Physician to Guy's and the Evelina Hospitals, Physician to Seamen's Hospital, Greenwich. Pp. 1111. London: J. & A. Churchill. 16s. net.

FOR many years, Dr. Frederick Taylor's *Manual* has been the favourite text-book for medical students, and, in spite of the advent of many new small text-books of medicine, it still holds its own. The eighth edition has been very carefully revised, and brought up to date, so that it may still be considered *the* text-book to read for the final examinations. Much new matter has been introduced, particularly do we refer to that dealing with Opsonins, Paratyphoid, Kala-Azar, Heart-block, Vincent's Angina, Congenital Hypertrophic Stenosis of the Pylorus, and Ochronosis—a rare condition, where there is black pigment deposited in the cartilages of the ears—Sclerotics, and the Skin. There are eight excellent plates, illustrating skiagrams of the chest in pulmonary, cardiac, and vascular diseases. The present edition is certainly one of the most complete of the smaller text-books of medicine.

Lectures on Medical Jurisprudence and Toxicology. By F. J. SMITH, M.A., M.D., F.R.C.P., Physician to, and Lecturer on, Forensic Medicine at, the London Hospital. London: J. & A. Churchill. 8s. 6d. net.

THE medical student will welcome the second edition of Dr. Smith's book. The plan and scope of it remain unaltered, although some points, open to expert criticism, have been modified. Three new lectures have been introduced, namely, on the Examination of the Person Alive or Dead, on Anæsthetics, and on Death Certification. The student will find in these lectures all that is essential for examination purposes. In order to assist him in this direction, there are added some questions from examination papers, which have been set by the various universities. A valuable appendix on Drunkenness from the police surgeon's view is also added.

The Diagnosis and Modern Treatment of Pulmonary Consumption, with Special Reference to the Early Recognition and the Permanent Arrest of the Disease. By ARTHUR LATHAM, M.A., M.D., M.A., F.R.C.P., author of the Prize Essay on the erection of the King Edward VII. Sanatorium; Physician and Lecturer on Medicine at St. George's Hospital; Senior Assistant Physician at the Brompton Hospital for Consumption and Diseases of the Chest, etc. Third Edition. Pp. viii + 260. London: Baillière, Tindall & Cox.

THE fact that this book has reached a third edition in so short a space of time since its first appearance, is ample testimony to its value as a practical work by an author of great experience on the subject. Additions have been made to various sections, and new sections appear on the value of the opsonic index in diagnosis and treatment, the use of Koch's new tuberculin in treatment, and Dr. Paterson's observations on the value of manual labour.

The Book of Prescriptions (Beasley). Containing a complete set of prescriptions illustrating the employment of the materia medica in general use; comprising also notes on the pharmacology and therapeutics of the principal drugs and the doses of their preparations according to the imperial and metric systems, with an index of diseases and remedies. Re-written by E. W. LUCAS, F.I.C., F.C.S.; late Examiner to the Pharmaceutical Society of Great Britain; with an introduction by ARTHUR LATHAM, M.A., M.D., F.R.C.P. Ninth Edition. Pp. xvi + 366. London: J. & A. Churchill. 6s. net.

THIS edition follows hard upon the heels of the eighth, and should assuredly prove equally successful. Notes on the more important new remedies have been included, which bring the book thoroughly up to date, in so far as this can be done in view of the bewildering increase in new remedies which is always going on. Mr. Lucas wisely selects those of proved utility. Dr. Latham's introductory remarks are addressed to senior students; but many a practitioner will find them suitable for inward digestion, and, as the book itself will often prove a friend in need, it should always be in a handy position on the writing-table.



Notes by the Way.

H.R.H. and
F.R.C.S.

THE profession of healing has gained in honour as well as in efficiency since the historic days when the surgeon was merely a barber who practised phlebotomy in his spare time. That is one's first reflection on the announcement that the Prince of Wales has consented to be elected a Fellow of the Royal College of Surgeons. The second reflection is that here is another example of the sincere and constant interest taken by the Royal family in the advancement of our profession. The King's preoccupation alike with medical theory and with its practical application has been evinced repeatedly and in many ways. His Majesty has long watched with concern, and stimulated by his initiative, the attempt to stamp out tuberculosis, and to make an effective attack upon cancer. The projected Radium Institute is the proof of his zeal for the latest therapeutic developments and discoveries. The help rendered by the Queen to the costly Finsen light department at the London Hospital shows that Her Majesty's interest in such matters is not less lively; while—if we may turn suddenly from great things to small—the presence recently of His Royal Highness at the semi-final football cup-tie between the London Hospital and Guy's was not less gratifying to the students engaged in the contest than any graver manifestation of his sympathy with their proceedings would have been.

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Races for
Boys.

CROSS-country races in general, and cross-country races for school-boys in particular, have lately been the subject of a long correspondence, alike on the part of writers, who know what they are talking about, and others who appear to imagine that generalisation from a single instance is the soundest of all methods of inductive reasoning. All of us probably can quote cases of boys who have taken part in such races and derived more good than harm from them; but the cases only prove that the boys in question were strong enough to take part in the pastime and did not presume upon their strength. The danger arises when the public opinion of a school—and in some cases even a rigid school regulation—imposes the pastime upon all boys indiscriminately, without

reference to their strength, unless they present a claim for immunity supported by a medical certificate. Such certificates, it is plain, are not likely to be given unless they are asked for, or to be asked for in all the cases in which they ought to be given. High-spirited boys, indeed, are more likely to suppress the certificates when they have got them than to apply for them as excuses for malingering. Hence a great deal of heart-trouble directly due to excessive and premature physical exertion. We are far from wishing to condemn any kind of sport because it lends itself to abuse, and, when abused, does harm. Still less do we endorse the view that cross-country races are necessarily injurious, as some have said, to all lads under nineteen. It is important, however, to combat the view that violent exercise is always beneficial in the absence of specific organic disease; and it is specially important to do so in the case of a pastime which imposes equal efforts upon boys of various degrees of vigour. The muscles of the heart, like any other muscles, may be strengthened by well-regulated exercise; but the regulation of the exercise is of the essence of the proposition. The exercise which strengthens one heart may cause another, first to hypertrophy and then to degenerate; and hard running without previous training is specially liable to do harm. Medical inspection, according to the system in vogue at Rugby, seems the true solution of the problem. A school medical attendant can, if given the opportunity, do quite as much good by advising in matters of this kind as by prescribing for mumps, measles, and chicken-pox.

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The Boat Race.

A COLLATERAL subject worth envisaging, since it is topical, is that of the risk, if any, to a man's health involved in his taking part

in the University boat-race. It is a question which has often been canvassed in both the medical and the sporting papers; and enquirers have taken the trouble to trace the history of old Blues, enquire after their health, and compute their expectation of life. It appears that their expectation of life is approximately the same as that of their less athletic contemporaries, and that their health, as a rule, is good. A few rare cases, however, have been discovered of men who

have suffered from heart-trouble, or neurasthenia, and held the strain of the boat-race responsible, averring that they have never been well since they took part in it. The conclusion to be drawn, therefore, is tolerably obvious. A man seldom gets the chance of rowing for his University unless he is strong enough, constitutionally as well as muscularly, to do so ; but a sufficient number of men physically unfit for the strain creep through to make the case for competent medical supervision clear. Moreover, from the scientific point of view, it is not sufficient to know what happens to the men finally selected to take part in the race. We also need to know what happens to the men who compete for the honour of representing their University, but are weeded out before the day of trial because they are not quite strong enough. Is their expectation of life also high ? And do they, too, in an overwhelming majority of cases, enjoy good health ? That is a side-issue of the subject which deserves more scientific consideration than it has so far received.

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Dust.

AT the moment of writing one is tempted to think of dust as an agreeable alternative to slush. No doubt, however, the opposite view will prevail presently; and in the meantime the problems, which we may rely upon the dust to raise, may be examined without prejudice. In the country dust is a nuisance, especially to those of us who have gardens adjoining the high road. In the town it is not only a nuisance, but also a danger to health, though the danger has only been realised in comparatively recent years. The grit of which it is composed would be bad enough if it were clean grit ; but, as a matter of fact, it is filthy grit, mixed up with dried horse excrement and dried sputum, and so forming an admirable medium for the culture and dissemination of pathogenic micro-organisms, which the wind blows into our mouths and up our nostrils, and which the trailing skirts of careless women introduce into our houses. Probably it is the cause of a great many of those sporadic cases of typhoid for which we are at a loss to account ; and we may with almost positive certainty attribute to it a great many of those septic sore-throats, which influenza convalescents are apt to develop after going out for the first time. Indeed we have even known cases of acute stomatitis, supervening on

influenza, of which we firmly believe the dust to have been the exciting cause.

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**Canned
Food.**

IT will be remembered that, at the close of the South African War, large quantities of canned foods of no inconsiderable antiquity were bought up by speculative dealers and found, when put upon the market, to be in a deplorable condition, largely in consequence of tin contamination. Hence the "Reports to the Local Government Board, by Dr. G. S. Buchanan and Dr. S. B. Schryver, on the presence of tin in certain canned foods" which have just been issued. They are long documents, and we can do no more than extract their central propositions. All canned food, it is pointed out, is liable to this kind of contamination, as a result of the contact of the food with the tinplate of the can; and the liability is greatest in the case of soups, meat extracts, and essences, and certain vegetables, and fruits. As a rule, the salts of tin are not present in poisonous doses; and the danger of cumulative poisoning, as the result of repeatedly absorbing small doses of the salts, does not appear to be grave. This last fact Dr. Schryver established by courageously experimenting on himself. He took from one to three grains daily at meal times for a period of three weeks, found that they did him no harm, and demonstrated, by the usual methods of analysis, that the tin did not accumulate in his system to any deleterious extent. He adds, however, that the quantity of tin taken up by the food increases with the lapse of time, and that food containing more than two grains of tin to the pound should be regarded with suspicion and left uneaten, except under the pressure of extreme necessity. It follows as a corollary that inspectors should devote their particular attention to canned foods which have been more than a year or two in the can; and, in order that they may be able to do this, and so defeat the machinations of speculative dealers, compulsory provision should be made for the stamping on every can of the necessary information as to the date and place of preparation. Speculative dealers probably will not like that, but they will be hard put to it to discover any plausible objection to which the rest of mankind will be willing to lend a sympathetic ear.



Practical Notes.

RECTIFICATION OF FACE PRESENTATIONS.—When during labour the cephalic pole of the child is lowest, and the head is well flexed, some portion of the vertex is the most dependent and prominent part, and forms the presenting part. Where the head is somewhat more flexed, the brow becomes the presenting part, whilst, with the head in extreme extension, the face presents with the chin as its lowest and most prominent part, and the positions are accordingly named from the relations which the chin bears to the maternal structures, as left mento-posterior, and so on.

Fortunately face presentations are somewhat rare, occurring once in 250 labours, or 0·5 per cent., since the maternal mortality in such cases is increased six-fold, and the foetal mortality is trebled. Obviously, if the condition can be recognised early and rectified, that is, the presentation turned into a vertex presentation, these dangers will be considerably decreased. For this purpose two methods, those of Schatz and of Baudelocque, are recognised.

Schatz's method consists of external manipulation applied before the onset of labour, or soon after it has started. The obstetrician directs pressure against the child's thorax through the mother's abdominal wall, and, at the same time, an assistant pulls the breech forwards. In this way, the child's body is made to assume an attitude of complete flexion, and the flexion of the head is thereby secured.

Baudelocque's method consists of a combination of internal and external manipulation, and may be employed after the failure of Schatz's method. Either the occiput is pulled down with the internal hand, and the child's body is flexed by pressure from without by the external hand, or the chin may be pushed up with the internal hand, whilst the occiput is pushed down by the pressure of the external hand. By either of these manœuvres, the face gives way to the vertex as the presenting part, and a normal and easy labour is thereby assured.

INDIGESTION.—The quantity of pepsin secreted by the stomach is, of course, of equal importance with the amount of hydrochloric acid, but it is not usually estimated in the examination of the contents of the stomach removed after a test-meal. The reason is that there has not been, up to the present, a simple and trustworthy quantitative test, and this W. H. Willcox (*Lancet*, July 25, 1908) claims to have devised by making use of a simple test for rennin: he found by preliminary tests that the quantities of the two ferments are usually proportionate the one to the other. The method is as follows:—Into each of a series of narrow test-tubes ($5 \times \frac{3}{8}$ ins.) 5 cc. of fresh unboiled milk is placed, and they are put in a water bath at 40° C. The filtered gastric contents is added from a pipette graduated in $\frac{1}{100}$ ths of 1 cc., the amounts required being .01, .05, .1, .15, .2, .25, .3, .35, .4, .5, .6, .7, and .8. The gastric contents and the milk are mixed together, and the whole incubated for 30 minutes in the water-bath. Then each is inverted, and it will be found that, if sufficient gastric fluid has been added, the milk will have set into a hard curd. This amount may be taken as the measure of the rennin activity, and, presumably, of that of the pepsin. In health, about .2 cc. is required in the case of the adult, rather more with children. In cancer of the stomach usually much more is required—.5 cc. or more. In ulcer ventriculi, and in hyperchlorhydria, the rennin activity is usually abnormally high, and .05 or less may cause complete clotting.

A new method by which the amount of pepsin is estimated directly is given by Solms (*Zeitsch. für Klin. Med.*, Vol. LXIV., p. 159). It is carried out by determining the amount of the gastric fluid which (when suitably acidified) will just clear a milky emulsion of ricin in three hours. The emulsion is prepared by adding half a gram of ricin to 50 cc. of salt solution (1 per cent.) filtering, and adding .5 cc. of decinormal HCl. Into each of five tubes Solms puts 2 cc. of this milky fluid, and .5 cc. of decinormal HCl. The gastric fluid is then diluted with distilled water, the amount of dilution being 100—1,000 times in normal cases, 10—100 in hypo-acidity and 100—10,000 in hyperacidity, some of the fluid is boiled, and the tubes are filled up thus:—(1) contains

1 cc. boiled gastric fluid, (2) contains .9 cc. boiled and .1 unboiled, (3) .8 and .2, (4) .5 of each, and (5) 1 cc. of unboiled; thus each tube contains 3.5 cc. of fluid, and they are all equal in every respect, except that they contain varying amounts of the unheated gastric fluid. They are incubated for three hours, and the dilution in which the ricin is just dissolved is noted.

Anders advises an exploratory laparotomy in cases suspected to be cancer of the stomach, if all or a majority of the following indications are present. (1) If the patient is between 45 and 70, that being the period at which the disease is most prevalent. (2) If slight or moderate indications of secondary gastrectasis exist, as shown by X-ray and physical examinations. (3) If, on several examinations, the hydrochloric acid of the stomach contents, removed after a test meal, is low or absent, particularly if lactic acid is also found. (4) If there is wasting without other assignable cause, and moderate anæmia with a low colour-index and possibly leucocytosis. (5) If the condition resists treatment for several weeks. (6) If epigastric rigidity is present. (7) If a constant positive blood reaction is given by the stools with good motor functioning on the part of the stomach, and neither free hydrochloric nor lactic acid is present. Anders emphasises the fact that a single laboratory or other test may prove nothing, yet they are of confirmatory value if systematically repeated, *e.g.*, at intervals of a few days for a couple of weeks or more. (*New York Med. Journ.*, 1908, November 21.)

THE TREATMENT OF NÆVI BY CO₂ SNOW.—Pusey, of Chicago, prepares the CO₂ snow by allowing the liquefied gas to escape into chamois leather, when it freezes into a solid white "snow." This is compressed firmly between two layers of the leather into a small snowball, from which a piece of the required size and shape is cut. This is then applied by means of forceps to the nævus to be treated, and allowed to act for 10—30 seconds; the skin is frozen almost immediately, and there is a subsequent violent inflammatory reaction with destruction of tissue, followed, however, by very little scarring. The freezing is painless, and there is only a slight

stinging sensation during the process of thawing. The treatment is chiefly of value for large pigmented nævi, portions of which only are attacked at a time, and the process repeated, if necessary, until all pigment is removed. (*Jour. Amer. Med. Assoc.*, 1907, October 19.)

ALCOHOLIC INTOXICATION.—Pouchet recommends the following draught in the treatment of acute alcoholic intoxication :—

Ammonium Acetate	-	-	-	gr. xxx.
Sea Salt	-	-	-	gr. xxv.
Infusion of Coffee	-	-	-	℥jss.
Syr. Simplex	-	-	-	℥j.

To form two doses, to be given, at intervals of 15 minutes.

TREATMENT OF SEA-SICKNESS.—Louis Maillet distinguishes between the form due to auto-suggestion, and the true or somatic variety. The first requires psychical treatment, sedatives (small doses of opium, sulphonal, or veronal) should be given, and the patient must be impressed with the physician's belief in the efficacy of these remedies. Hypnotism or suggestive treatment is also of value.

The somatic form responds well to gastric sedatives, especially cocain (hydrochloride?). He advises that the patient should take a purge before the commencement of the voyage: take 40-80 centigrams of sulphate of quinine (6-12 grains) or one milligram of strychnine (about $\frac{1}{85}$ th gr.), to wear a tight belt, to lie down from the time the vessel starts, and to take another dose of strychnine if the passage is bad.

Prou recommends the Trendelenburg position, and gives the following :—

Antipyrin	-	-	-	gr. 90.
Caffeine	-	-	-	gr. 15.
Cocain hydrochlor.	-	-	-	gr. jss.
Strych. sulph.	-	-	-	gr. $\frac{1}{8}$.
Alcohol	-	-	-	℥jss.
Syr. Simplex	-	-	-	℥jv.

One ounce (a soup-spoonful) to be taken before embarking

and subsequently three times a day.

Numerous other remedies have been suggested. Skinner's method, which has been highly recommended by McDougall, consists in the hypodermic administration of:—

Strych. sulph.	-	-	-	gr. $\frac{1}{30}$ — $\frac{1}{30}$
Atropin sulph.	-	-	-	gr. $\frac{1}{150}$
Aq. menth. pip.	-	-	-	m. 10–15

This is given at the very onset of the symptoms, and, if necessary, repeated in a few hours or next day. It may be given as a prophylactic before the onset of the nausea in susceptible persons.

TREATMENT OF PRURIGO.—Robin (*Bull. gén. de Thérapeutique*, November, 1908) holds that prurigo is always due to an internal cause, and finds that abnormal fermentive processes are constant, even although the patient does not complain of any digestive trouble. Further, the sweat is extremely acid, lactic acid being present.

His treatment consists in cutting off the ingestion of fermentable foods, fats, pastry, sugar, etc. The amount of animal food is reduced to a minimum, and the only beverage allowed is water. Strychnine, or nux vomica, is given ten minutes before, and a powder of the following composition after, the meals:—

Magnesii hydrate,				
Sodii bicarb.	-	-	-	- āā gr. 60
Calcii carb. precip.	-	-	-	- gr. 90
Belladonna (pulv.)	-	-	-	- $\frac{9}{10}$ gr.

Misce.: fit pulv. xii.

As regards local treatment, he advises the use of a 2 per cent. solution of silicate of soda. This is painted on, allowed to dry, and dusted with the following:—

Starch	-	-	-	- ʒij.
Oxide of zinc	-	-	-	- ʒss.
Powdered camphor	-	-	-	- gr. 30.



THE PRACTITIONER.

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THE USE AND ABUSE OF PROPRIETARY FOODS IN INFANT FEEDING.¹

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THE title of this paper implies that proprietary foods have a certain value in the dietary of infants, and that injurious effects may arise from the injudicious or ignorant employment of them.

A "proprietary food" is one which is supplied by a manufacturer, under a special registered trade name, and more or less protected from imitation by the ægis of the law. The number of them is legion. New ones are frequently advertised. Many have been on sale for years, and have an established reputation. They may be grouped into different classes, in accordance with their composition, and may be considered in these groups in accordance with their suitability for infants. The largest group consists of preparations from milk, with or without the addition of cane sugar. In another group may be placed the foods prepared from milk, with the addition of carbohydrates, other than cane sugar, in the form of starch, which may be unaltered, or partly or entirely changed into dextrins, maltose, and dextrose. A third group consists of pure carbohydrate foods. And the last contains the preparations from meat.

I.—FOODS PREPARED FROM COW'S MILK ONLY.

i. *Dried Milk Powders*.—(a) Practically pure casein, containing from 75 to 85 per cent. of protein, is sold under the names of Biogene, Casumen, Plasmon, Protene, and Tilia.

(b) Desiccated whole milk is sold as Lacvitum and Glaxo. The percentage composition of Glaxo is protein 22·2 ; fat, 27·4 ; sugar, 41·0 ; ash, 3·4 ; water, 6·0 (*Guy's Hospital Gazette*).

(c) Lacumen is a desiccated skimmed milk.

¹ Read before the Wimbledon Medical Society.

(d) Casein can also be obtained in combination with ammonia as Eucasin; with sodium as Nutrose; with 5 per cent. glycerophosphate of soda as Sanatogen; with 20 per cent. of albumose as Sanose.

Not one of these preparations, except those from whole milk, could possibly be a satisfactory food as a sole diet of a baby. Glaxo, or Lacvitum, might be used as a temporary food during hot weather, or an attack of diarrhoea. A dilution of one part with from eight to twelve of water will form an appropriate mixture, somewhat deficient in sugar. A more satisfactory food of this character is the Allenbury No. 1 Food, for it is a dried cow's milk, modified by the reduction in the proportion of casein, and increase in the fat and sugar. A dilution of one part in ten of water yields a mixture containing about 1 per cent. of protein, $1\frac{1}{2}$ of fat, and $6\frac{1}{2}$ of sugar. Thus it is relatively deficient in fat, and rather weak in protein. Hence, though it may be useful as a temporary food during the first months of life, it must not be given for long periods of time. Casein is a valuable food for older children, especially for growing children, whose diet is deficient in protein. Skimmed-milk cheese, still better cheese from whole milk, is much superior to jam, as an article of diet. Dried casein is valuable in cases of acid dyspepsia in infants, and as an addition to a diet of condensed milk which is deficient in protein. When added in this form, it does not give rise to large indigestible curds in the stomach.

ii. *Modified and Predigested Milk* can be obtained, and so too a condensed peptonised milk. Preparations are sold under the name of Facsimile Human Milk. These occupy the borderland between proprietary foods and ordinary articles of diet, and should be avoided. Of the objections to modified milks, such as are supplied by various milk laboratories and milk companies, the chief are the lack of freshness, the absence of variety, and the pasteurisation. Nature never intended a baby to have an unending series of meals of the same amount, the same percentage composition, the same degree of alkalinity, and at the same intervals. The composition of human milk varies at each nursing and during each nursing, so much so, that the baby gets a series of meals of which the first is thin, watery, and poor in fat, and the final one almost pure cream. If you want to give

a modified milk, have it modified at home. So, too, if a peptonised milk is needed. If possible have it prepared by a trained nurse. It can then be regulated in composition and degree of peptonisation, according to the requirements and progress of the child. The shop article is liable to contain an excess of albumoses and peptones, and there is no guarantee that the degree of predigestion is the same in each sample. The predigestion of milk, as a temporary measure, is of the utmost value, and as a diet of this nature does not weaken the digestion, it may be continued for two or three months, if necessary, without ill-effects.

iii. *Condensed Milk*, with or without the addition of cane sugar.—Only those milks, which are condensed from pure, clean milk, undiluted, or enriched by the addition of cream, are permissible for infant feeding. The cheap brands on the market, prepared from skimmed milk, should be prohibited except for adults. Of those made without the addition of cane sugar, by the simple condensation of milk to about one-third of its bulk, the best varieties are the Ideal, First Swiss, Peacock, Viking, and Hollandia brands, containing roughly about 10 per cent. each of protein and fat, and 15 per cent. of sugar. When once the tin is opened, the milk keeps badly, especially in hot weather. It is useful as a temporary food in alimentary troubles due to an excess of cane sugar, and in diarrhoeal affections. It may require the addition of a little sugar to make it palatable.

Condensed milks, with added cane sugar, contain about 10 per cent. each of protein and fat, and 50 per cent. of sugar. The Milkmaid brand and Nestlé's are as good as any. They now belong to the same company, have a very stable composition, and are prepared under the strictest precautions. The purest cane sugar is bought, and it is still further purified before being added to the milk. Of other brands may be mentioned the Rose, Anglo-Swiss, and Full Weight. A dilution of one in eight of water forms a mixture somewhat like human milk, except for the grave deficiency in fat. A humanised condensed milk is obtainable. Cream and lactose are added before condensation.

The great advantage of condensed milk is that it is given in the form of a weak dilution which can generally be digested by

the most weakly infant. Though it is undoubtedly true that a veritable holocaust of infants has been due to condensed milk, either directly or indirectly, in consequence of the various ailments which they might have escaped if they had been brought up on a proper diet, the supporters of this food can claim for it a large amount of success, and a very definite value. Many infants have recovered as the result of a diet of condensed milk, even after almost every other modification of milk has been tried.

It may be given in many varieties of marasmus, catarrhal affections of the alimentary tract, and sometimes in acute diarrhoea. If it is insufficiently diluted it will cause vomiting. It must be given in proper quantities at regular intervals. In hot weather it undoubtedly forms a suitable food for a delicate infant, and even for a healthy one, under those conditions of life, in which the only available supply of cows' milk is often dirty, lacking in freshness, kept from going sour by the addition of preservatives, contaminated by faecal matter at the farm, by dust on its journey to the retailer, and by flies while exposed in bowls on the shop counter of a general dealer.

Its defects are its lack of freshness, its deficiency in fat, its low proportion of protein, the changes due to heat, and its high sugar content. The abuse of it is well known in the common results, such as anæmia, rickets, unhealthy fatness, a flabby state of the muscles and tissues generally, when it has been given in liberal quantities. Children so fed are liable to bronchitis, broncho-pneumonia, and catarrhal affections of the gastro-intestinal tract. In insufficient amounts it causes marasmus and pot-belly. In any case, flatulent distension of the intestines may arise from the excess of sugar, leading to the production of hernia, or the maintenance of one already existent.

How then are we to counteract the obvious disadvantages? It must be given in sufficient quantity. It is a mistake to suppose it a cheap article of diet, for, if given in proper amount, it costs more than the cow's milk it replaces. In hot weather, more frequent feeds, if well diluted, can be given than when a diet of cow's milk is ordered, for the excess of water rapidly passes out of the stomach, and is excreted by the skin and kidneys. In cold weather, it is chiefly excreted by the kidneys. The addition of a little dried casein compensates for the low

proteid content. Better still is the addition of a teaspoonful of egg-white to each bottle, if it agrees. Meat juice is not to be recommended, especially in hot weather. Apart from the possibility of the transmission of tapeworm, the difficulty of obtaining fresh meat, and of keeping the prepared juice fresh is very great. I have seen several fatal cases of ileo-colitis which were undoubtedly due to home-made meat juice.

The deficiency of fat can be compensated for by giving an emulsion of cod-liver oil. Almost every infant can be taught to like this oil, if it is not given in too large doses to start with. A very useful mixture is the combination of the yolk of a new-laid egg with an ounce each of cod-liver oil and glycerine, and a little creosote, or thymol, as a preservative and intestinal antifermentative. From one half to one teaspoonful can be given two or four times a day for months at a time. In addition to its nutritive value it will protect the child from anæmia, scurvy, and rickets. In poor class practice, it is rather difficult to prevent the occurrence of scurvy in infants, brought up on proprietary foods. The addition of sweetened grape juice or orange juice, well diluted at first, to the diet is an almost certain safeguard, but it is impossible to ensure its regular administration. Barley water has a mild antiscorbutic value. Fortunately scurvy is a disease of very slow development, and the poor rarely continue a strict diet of cooked foods sufficiently long to produce it.

Though all these statements indicate that condensed milk is a useful food, it is obvious that infants, brought up on it, require constant supervision in order to prevent the ill-effects that may arise. Unfortunately the babies who are most likely to be fed on this food are of the class, which is least able to pay for such supervision. Hospital out-patients are seen every week or fortnight, but those who do not receive this or similar supervision, run very grave risks, unless the instructions as to diet, cod-liver oil, and fruit juice are fully written down, and explained, and rigidly followed.

II.—FOODS PREPARED FROM COWS' MILK WITH ADDED CARBOHYDRATES.

(a) *Condensed milk with malted flour* is sold under the names of Allenbury No. 2 Food, Horlick's Malted Milk, and John

Bull No. 1 Food. These are practically devoid of starch.

(b) *Condensed milk with partly malted flour*, as in Manhu, Milo, and Theinhardt's Infantina.

(c) *Condensed milk with unchanged flour*, as in Anglo-Swiss, Franco-Swiss, and American-Swiss foods.

The same objections hold good as for condensed milks. Perhaps malt sugar is less injurious than cane sugar. The foods which contain starch are only suitable, except in very small amounts, after the sixth month of life. Two other foods worthy of mention are Benger's Food and Carnrick's Soluble Food. The latter is composed of desiccated milk, malted wheat flour, and lactose, and, in the process of preparation, the casein is partly digested by extract of pancreas. It is comparable with the foods made from condensed milk and partly malted flour, and is much inferior to Benger's Food, as that is made with fresh milk. Benger's Food is a mixture of cooked wheaten meal and extract of pancreas. In the process of preparation, mixing it with warm milk and water, the ferments partially peptonise the proteins, and partially convert the starch into soluble dextrans and sugars. The fat is unaffected. It is most valuable for marasmic infants after the sixth month of age, but can be used even three months earlier, if given in small amounts, say, one half to one teaspoonful in each feed. The addition of a small half-teaspoonful to each feed is about equivalent to using thick barley-water instead of water in the food mixture, and has the additional advantage of partly digesting the food. If it agrees with the child, it can be continued for some months, provided it is never forgotten that the prime constituents of the diet are the milk and cream with which the food is mixed, and that it must not be increased in quantity at the expense of these constituents. As a recent instance of its value, the addition of one teaspoonful to the diet of a child, aged four months, who had remained practically stationary in weight for a month, resulted in the gain of nearly a pound in weight in one week.

III.—CARBOHYDRATE FOODS.

(a) *The Starch practically unchanged*.—Neaves', Ridge's, Opmus, Albany, Robinson's Patent Barley and Groats, Scott's Oat Flour, Chapman's Flour, etc.

(b) *Partly Malted Foods*.—Allenbury No. 3, Cheltine Infants' Food, Coomb's Malted Food, Hovis No. 2, John Bull No. 2, Moseley's, and Savory and Moore's Food.

(c) *Completely Malted Foods*.—Mellin's, Horlick's, Paget's Malted Farina, and Hovis Babies' Food. Others of a like nature are Cheltine Maltose Food, Diastased Farina, and Racia. Clearly, none of these carbohydrate foods is a suitable diet in infancy, but they can be added to milk, if used judiciously. Generally speaking, in the first three months of life, the only permissible proprietary foods are those made from condensed milk, with or without the addition of cane sugar, or of a completely malted flour. These foods are also useful, under certain temporary conditions, in the second three months of life. At this age, too, we can make use of the completely malted carbohydrate foods as an addition to the milk mixture instead of sugar; of the more or less malted foods, in a similar manner, provided that they are given in small quantities, and do not produce flatulent distension of the intestines; and even of the foods consisting of unchanged starch, especially those which undergo partial conversion in the process of preparation, and, at the same time, partially peptonise the milk proteins. In the third three months of life, mothers constantly clamour for the addition of some food to the milk mixture. Simple barley water, gradually thickened, is sufficient, and will educate the child in the digestion of starch. If not, it is more advisable to give a completely malted food, than one partly malted, and finally one of unconverted starch. Malted foods are very fattening on account of the excess of sugar they contain. If an excess of sugar is desired, it can be given in this form, as lactose, or as maltose, or dried extract of malt. A huge fat baby, with the bloated appearance characteristic of one fed on an excessive diet of malted food, is a source of danger, for mothers and nurses overfeed their charges in order to emulate the monstrosity, which may even perhaps have received a prize at a beauty show, and yet, to the medical expert, be a rachitic mass of unhealthy fat.

IV.—MEAT PREPARATIONS.

These include various brands of meat teas, meat extracts, meat juices, meat jellies, peptones, peptonoids, and meat

powders. It is doubtful whether any one of them is necessary in infant feeding, though they may be of occasional value in illness. Almost all of them consist of extractives of no nutritive value, perhaps stimulating to the digestive functions, possibly throwing an extra strain on the liver and kidneys. The high proportion of salts and extractives is liable to cause thirst and diarrhoea. Diarrhoea is especially apt to be induced by peptone preparations. Some of the meat jellies, though expensive and innutritious, have a pleasant flavour, and as nice, clean, cool mouthfuls are grateful and comforting to a feverish infant who refuses food. They are still more comforting to the anxious mother, who fears her child will succumb to starvation, and who has a profound faith in the nutritive value of these preparations. In small quantities they do no harm. Similarly a hot clean fluid, such as beef-tea, is pleasant to the febrile tongue and disordered digestion. As ordinary articles of an infant's dietary these foods must be condemned. They are apt to spoil the child's appetite for the simpler milk and carbohydrate foods, and they undoubtedly, if given in any quantity, cause an irritable, neurotic state of the nervous system, and a tendency to night terrors.

If more protein in the diet is required, it can be given in the form of casein, the gravy from undercooked meat, or the white of egg. There is no serious objection to giving home-made chicken tea, mutton broth, and similar foods in the last quarter of the first year of life, but it is clear, from their composition, that they are of little value as foods. They may be given to fat, plethoric, over-fed children, who have been brought up on an excess of malted foods, cream, and milk. A daily feed of chicken broth, thickened with some cereal and pounded vegetable, will give the stomach a little rest, and reduce the total calorific value of the diet. The proprietary beef-teas, etc., may be used under similar conditions.

Sometimes it is important to ascertain the calorific value of an infant's diet. Proportionately to age and weight, the child requires a greater number of heat calories than the adult, for the loss of heat from the surface is greater, seeing that the proportion of superficial area to bulk diminishes with

increasing weight. An active adult requires about 40 calories per kilo. of body weight, but an infant needs 100 to 140. Each gramme of protein and carbohydrate yields 4·1 calories, and each gramme of fat yields 9·3 calories. But it is physiologically unsound, and injurious to provide these heat calories indiscriminately from carbohydrates and fat. A due allowance of fat is absolutely necessary for other purposes as well as the supply of heat. The evil results of proprietary infant foods would be much less, in frequency and degree, if a proper amount of cream were added to the diet, or fat given in some other form.

I cannot refer to the composition of all the meat preparations, but should like to mention that *Liebig's Extract* should be free from protein and fat; that *Bovinine* appears to be a mixture of blood and glycerine; that *Puro* is apparently mainly made of egg albumin; and that *Vinsip* is a mixture of blood, boric acid, and alcohol. *Bovril* seems to be one of the most trustworthy and nutritious. No meat preparation containing alcohol, or kola, should be given to infants.

In conclusion, proprietary foods are not really necessary in ordinary circumstances. They are, however, often of very great value, more especially the malted foods, provided that they are used with discrimination as additions to the diet, and not as substitutes for cream or milk. Anyone acquainted with their composition, can clearly use them scientifically and advantageously, whereas ignorance is likely to lead to errors in selection and in quantity, and to fatal dietetic calamities. Unfortunately, the evil results of erroneous methods of feeding are not immediately apparent, perhaps do not develop for months, and they are constantly ascribed to other causes. The greater my experience in the feeding of infants is, the more rarely do I find it necessary to have recourse to these foods. On the other hand, they are often necessary and most beneficial.



A CONTRIBUTION TO THE SURGERY OF
INGUINAL HERNIA.

By RUTHERFORD MORISON, F.R.C.S.,

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[With Plate V.]

STATISTICS have proved that, by removal of the hernial sac and obliteration of the opening through which it came, a radical cure of hernia can be with certainty obtained in selected cases. Only the truss-makers doubt this, and their opinion is based upon an experience of operations done before a satisfactory technique had been established. In the case of the male with inguinal hernia, the second requirement is generally impossible, for the spermatic cord, in him, prevents obliteration of the opening through which the hernia came. This difficulty has now been surmounted by careful anatomical and surgical observations, and, in children and in healthy young adults after the operation of Bassini, a "cure" is as certain as after any surgical operation. I now wish to prove that neither age nor the size of an inguinal hernia is a contra-indication to the operation, as is stated in many books, and the chief stimulus to doing this was given by my late House Surgeon, Mr. Hamilton Drummond, who informed me that he had heard a distinguished surgeon say to his class in a London hospital that operations for inguinal hernia, in patients over 40, were so unsuccessful that they were not worth doing. As this was not my own belief, I asked him to search the hospital books for a record of my cases, and these prove that the operation is successful, and well worth doing.

There are two types of patient in whom operation has a worse chance of success than in others; but, with some extra care, even in them the failures will be few.

The first type is the thin "neurotic" individual, with "hernia belly" "bulging" on both sides, lax scrotum, varicocele, dry loose inelastic tissues, and lipomata in the inguinal canal and on the spermatic cord. The second type is the flabby fat person with a bubonocoele, not an honest hernia, a chronic cough, and a tendency to "bulge" on the opposite side.

The Operation.—It is not my intention to describe in full the details, which are now common property, of an operation for the cure of inguinal hernia, but only to mention certain details to which I attach importance.

After exposure of the sac by a clean cut division of its coverings, it is opened, and a finger introduced makes its separation from the cord, by peeling with dissecting forceps, easier than any other method.

After thorough separation of the sac, a finger is passed underneath the transversalis internal and external oblique towards the anterior superior iliac spine, and the outer angle of the wound is retracted up and out over the tip of the finger. A pair of suitable forceps is then pushed through the muscles overlying it, on to the finger tip, and is guided by this into the inguinal canal. The fundus of the sac is caught in

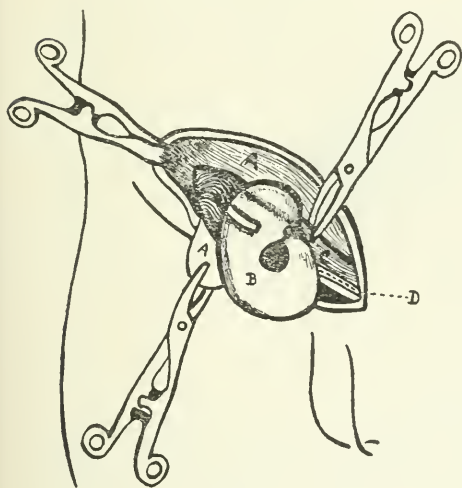


Fig. 1.

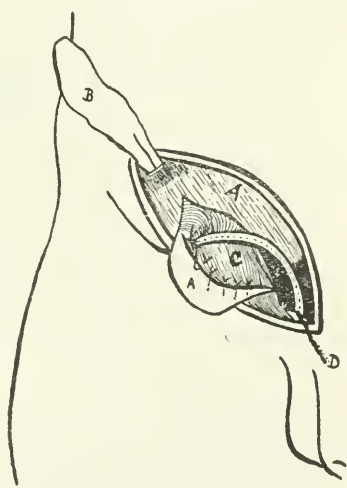


Fig. 2.

A. Divided aponeurosis of external oblique.
B. Sac. C. Arched fibres of internal oblique
and transversalis. D. Spermatic cord.

the forceps and drawn firmly through (Kocher). (Fig. 1 and Fig. 2). A + suture (Fig. 3 B.) is then applied on either side of the hole through which the sac projects, and tied securely, holding the sac in position, and closing the hole through which it came. The sac is cut off close, and its stump buried in a furrow formed by drawing the external oblique over it with a

suture. This method completely obliterates the sac, and avoids any risk of injury to the bladder. When the sigmoid flexure or the cæcum forms part of the sac, from a landslide of the abdominal contents, as much as is convenient of this is cut away, taking care to avoid the mesosigmoid, or mesentery of the cæcum, in which large vessels may for want of this be divided, and the remainder is sutured. The sutured portion is then drawn up into the abdomen by forceps grasping the suture, and passed through its wall as previously described. The cord is separated and held up from the inguinal canal, at the same time being cleared of any lipomatous masses adhering to it. A small vessel supplies each of these, and should be ligatured before its division. One suture above,

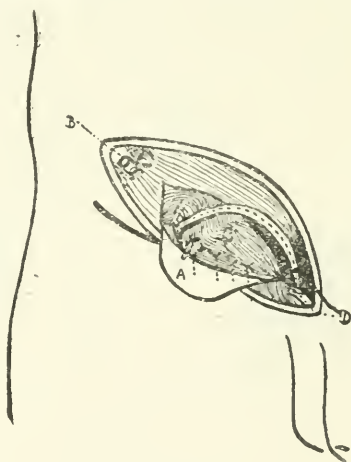


Fig. 3.

and from four to six below it, close the inguinal canal, except in children, for whom two or three sutures *over* the cord and without disturbance of it, suffice. Before introducing these sutures, the ilio-inguinal nerve, which usually runs over the arching fibres of the internal oblique, should be defined, and lifted up or down out of harm's way. Its inclusion in the sutures is the cause of lasting pain after operation. The arching fibres of the internal oblique and transversalis can always be conveniently brought down to Poupart's ligament, but, in old hernia, the conjoined tendon is frequently defective. In this case I divide the sheath of the rectus externally, and draw down and suture this muscle

to Poupart's ligament adjoining the pubic spine where recurrence usually takes place. Over the cord, the external oblique is carefully sutured, and if the underlying muscles are in any degree suspicious, this should be done in double-breasted fashion, the under flap reaching about one inch below the upper, to which it is sutured by eversion of the upper, and the edge of the upper to the cut edge of Scarpa's fascia below.

Some Local Predisposing Causes of Hernia.—The recurrences recorded offer evidence in favour of the view that a successful operation, performed on one side, is a predisposing cause of hernia on the other, which I do not doubt. Lipomata in the inguinal canal have more to do with the formation of hernia in adults than is generally recognised. Their growth is irresistible. By steady pressure they weaken the physiological closure of the canal, and by dragging down and pouching the peritoneum, to which they are attached, they pave the way for an easy hernial descent. The omentum from inside probably acts in much the same fashion as a lipoma does from the outside, only, by pushing as well as by pulling. When once a portion of omentum has found its way out of the abdominal cavity, it becomes thickened and grows (apart from strangulation and inflammation, I think) like a tumour, and enlarges the orifice through which it came and the sac in which it lies. (This is the general rule, though occasionally it may act as a plug and bring about a natural cure.) That it is the main factor in the production of traumatic post-operative hernia through the abdominal wall, I do not doubt. Prolapse of a small portion of omentum through the deep layers of the wound constitutes the initial stage. That it is the chief cause of the serious and obstinately progressive enlargement of the umbilical hernia of adults is scarcely open to doubt.

Another predisposing cause, of which I have seen no mention in the abundant literature of hernia, is a previous operation for the removal of the vermiform appendix. In a small percentage of cases, an inguinal hernia develops after healing of the wound, and on the same side. This may, I think, be attributed to one of two causes: either the inelastic and unyielding scar increases the inguinal pressure during exertion, or nerve division has led to degeneration of the arched fibres of

the internal oblique and transversalis muscles. In the latter case, it can be observed that, on exposure, the muscle has lost its reddish brown healthy appearance, has a yellow tint, has lost its elasticity and resistance, and is obviously more easily torn by sutures than normal muscle is.

Congenital and Acquired Sacs.—Many surgeons have adopted the view, advocated so ably by Hamilton Russell, that *all* hernias are due to preformed sacs, and it seems possible that this is true of the majority. The sac, in elderly patients in recurrent hernia, and in the inguinal hernia following operation for appendicitis, differs from an ordinary sac in several respects. The same rounded pearly outline, forming the landmark for the fundus of the sac, is not seen after division of the superficial layers covering the cord; the sac wall is always covered by a well-marked layer of subperitoneal fat; the peritoneum, forming the sac, is remarkably thin and brittle. An ordinary hernial sac, by contrast, is thick and strong, has no defined layer of subperitoneal fat covering it, and shows a well-defined rounded outline through many of the layers of fascia covering it. It may be that all hernias with such a sac are of congenital origin. If they are, the cone-shaped unilocular umbilical hernias of children are congenital, they possess a definite thick wall sac, free from a fatty layer outside; and the irregular bossed multilocular umbilical hernias of elderly women are acquired, for they possess an ill-defined thin sac covered with fat.

The largest hernia, upon which I have operated, was in a private patient, whose case is consequently not included in the statistics.

The case was that of a commercial traveller, aged 41, admitted to a private hospital on August 8, 1899. He had taken alcohol very freely up to a year previously, and was very stout. Though measuring only 5 feet 6 inches, he weighed nearly 17 stone. Otherwise he was in good health, though he had been delicate when a child.

His present trouble commenced as a small hernia 22 years ago, and this had gradually increased. He had no pain in it, but was occasionally troubled by an "indigestion" pain, though never by any strangulation symptoms. The swelling in the early years went back completely after he had gone to bed, but for several years, lately, had not been reducible. He had

never worn a truss. He wore a specially long frock coat reaching nearly to his ankles, in order to hide his trousers, which were made with the bifurcation reaching to the knees in order to accommodate an enormous scrotal swelling.

On examination he was found to have a left scrotal hernia, as large as his head, reaching nearly to the knees as he stood up. Both testicles could be felt close together near the lower part of the swelling, and to the right of the hernia. The penis was entirely buried, and the orifice of the prepuce was represented by a flat dimple like an umbilicus. The skin of the left thigh and scrotum adjoining was red and moist. An attempt to reduce the hernial contents into his contracted abdomen had to be abandoned when half had been replaced, as it caused much abdominal discomfort, and interfered with his breathing. He was sent to bed, the foot of the bed being elevated, and his scrotum was supported on a high pillow. His diet consisted of minced meat and hot-water only, with sufficient Epsom salts to cause some diarrhœa. Daily attempts were made to reduce the hernia, and after as much as possible had been replaced, a pad and elastic bandage were applied to maintain the reduction for so long a time as he could tolerate the contents in his abdominal cavity. At the end of a week of this treatment, the whole hernia could be reduced, and he could bear the increased intra-abdominal tension for two or three hours.

Operation.—August 18, 1899 (10 days after admission). The sac was opened by a long oblique inguinal incision. The contents, now almost entirely large intestine and omentum, were reduced, there were no adhesions, and the sac was separated. The investing fasciæ were much thickened, but the sac was like normal peritoneum. The sac was Kochered, all the vessels of the cord were removed, except those accompanying the vas deferens (Halsted), which was laid in the canal over the muscles sutured below it. The arched fibres and conjoined tendon were joined to Poupart's ligament by seven interrupted sutures, and, as the conjoined tendon was much spread out and thin, the rectus muscle was drawn over it after division of its sheath, and attached by separate sutures to Poupart's ligament over the inner half of the canal. The vas and its vessels were covered by the external oblique, which was sewn up by the double-breasted waistcoat method.

The wound healed by first intention without disturbance

and the patient returned home on September 5, 1899.

I had an opportunity of examining him by request nine years after the operation (August, 1908). He was in excellent health, not so stout as before, and had had no trouble of any sort with his hernia or bowels since the operation. His scrotum had not shrunk so much as I anticipated it would have done, but looked like a large wrinkled bag. The penis was still short and partially buried, but caused no inconvenience. Both testicles appeared to be normal in size and consistence. His inguinal region was quite strong; there was no sign of any recurrence of the hernia. The opposite inguinal region was also strong.

A COMPLICATED CASE. (See Fig. 4.)

B. E., aged 50, carman. Eight years ago he lifted a piano and, several days after, felt a lump in the left groin. He wore a truss which kept the hernia up for 3 years, after which time it recurred, and the truss was of no use. About five months ago, he noticed a small round lump on the right side (femoral hernia) which did not trouble him in any way, neither did he take much notice of it. He took no notice of any other lump.

The patient has had several attacks of pain and vomiting, but has never been laid off with strangulation.

Diagnosis:—Left vaginal hydrocele, and inguinal hernia;
Right inguinal hernia;
Right femoral hernia;
Right hydrocele of the cord.

Operation, November 29, 1904, right side.—Multilocular cysts found in right epididymis. These were dissected out so far as possible; a hydrocele of the cord was dissected out; small hydrocele of the tunica vaginalis found, and as much of the sac as possible was dissected away.

Inguinal and femoral hernial sacs excised. Both inguinal and femoral regions then closed. For the cure of the femoral hernia, suture of the conjoined tendon to Cooper's ligament over the ilio-pectineal line internally, and for the inguinal of the arched fibres of the internal oblique and transversalis to Poupart's ligament in the inguinal canal.

Progress:—In convalescence he had a bad cough.

Second Operation, December 8, 1904, left side. oblique

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PLATE V.



Fig. 4.—*A complicated case.*

incision over canal, sac of hydrocele turned inside out. The hernial sac was now dissected out and Kochered, the rest of the operation done after Bassini. Ext. obl. was double-breasted. He developed symptoms of pneumonia and cough on December 9, 1904. On December 24, 1904, he left hospital; the right side was rather red and moist; the left side was healed. On January 19, 1905, both sides were strong and well. On February 27, 1905, he had œdema of both feet. A year later reports that he is doing lighter work.

December, 1908, quite well.

Herniæ, over 40 years of age, from beginning of 1900 to end of 1906. Altogether 112 cases.

Year.	Period covered.				No. of cases.
1900	-	-	1 year	-	7
1901	-	-	"	-	13
1902	-	-	January to June	-	8
			July to December	-	10
1903	-	-	January to June	-	10
			July to December	-	12
1904	-	-	January to June	-	9
			July to December	-	14
1905	-	-	January to June	-	7
			July to December	-	8
1906	-	-	January to June	-	10
			July to December	-	4
7 years covered					112 cases.

Ages :—

Between 40-45 years	-	-	29 cases done.
" 45-50 "	-	-	25 " "
" 50-55 "	-	-	26 " "
" 55-60 "	-	-	13 " "
" 60-65 "	-	-	15 " "
Over 65 "	-	-	1 " " (æet. 73).

(This case cannot be found.) In 3 cases no note of exact age has been made.

Total - 112 cases.

Of the 112 cases, 68 are alive and well; 33 cannot be

traced ; 7 have since died from various causes independent of the hernia ; 1 died from an operation (*see* note) ; 3 have recurred (*see* notes).

Of the 7 that have died, with the exception of 2, a note has been obtained from the friends, stating that they were perfectly well, so far as the hernia was concerned, up to the time of death. Two have not replied.

In 5 cases the sigmoid was in the sac.

In 2 cases the bladder " "

In no cases of this series was the cæcum in the sac.

In 30 cases the ext. oblique was double-breasted.

The sac was Kochered in 82 cases.

The rectus muscle was brought down to Poupart's ligament in 2 cases.

In 1 case only, inguinal hernia on the right side came on after removal of appendix, 3 years previously.

Of the 3 cases which have recurred, all have been seen, and a short note is given below.

J. S., æt. 40.

In 1900, he had a right inguinal radical cure done by Mr. Morison.

In 1904, he had the left side done for a scrotal hernia. The sac was Kochered, and stump fixed in belly wall. Canal closed after Bassini's method. Chromic gut used. There were lipomata in both sacs, right and left side. The muscles were fatty and poor. Before leaving hospital the wound was reddened and discharged some serum.

He remained perfectly well until one month ago (September 1908), when he noticed a definite bulging over the inner aspect of the scar on the left side, and states that, after walking any distance, he is obliged to put his hand into his pocket and reduce a swelling into abdomen. The swelling has never come down into the scrotum. On examination there is a distinct bulging, about the size of a hen's egg, on inner side of wound.

The patient is extremely fat, and has an umbilical hernia the size of a Tangerine orange, which he states he has had for years.

J. B., æt. 60.

Femoral hernia, done 12 years ago by Mr. Morison. It was strangulated. Right side.

Eight years ago he noticed a lump come in the left side. He tried several trusses without any success.

On examination, the patient was a very thin man with pronounced hernia belly. He had a left irreducible scrotal hernia, which contained adherent omentum. On right side scar of femoral hernia perfect. At the operation an ordinary Bassini's operation was done, sac not Kochered, the adherent omentum was separated and replaced in the abdomen. He left hospital on March 16, 1903, healed and well. When seen, one year later, everything was perfect. One year ago (from the present time, November 1908) he noticed a small lump come down on the left side. He got a truss and has worn it ever since. The truss is quite efficient. Patient looked well, and is able to go about without any trouble. He states that he is greatly benefited by the operation, but there is a small hernial protrusion when he coughs at the inner end of scar.

R. B., æt. 69. Patient works regularly in the mine as horsekeeper; his work consists in looking after the ponies in the pit.

He is a strong active man, and states that the rupture came down several weeks after he left the hospital.

He went home healed from the infirmary, and commenced work seven weeks from the time of the operation. Since the rupture recurred, he has worn a truss, which he states is absolutely efficient.

On examination.—His belly is lax and pendulous. When the truss is removed, and the patient coughs, there is definite hernia of a large size (size of a big closed fist) which comes right down into the scrotum, and the contents are, as before, omentum and a considerable amount of small bowel.

On reducing hernia and putting one finger just at the spine of the pubes (or, to be quite correct, just to its outer side and above) and on getting him to cough, although the rupture is of such a large size and comes down so easily, the contents of the sac can quite easily be prevented from leaving the abdomen, the recurrence being a small one and close up to the spine of the pubes. He states that he is greatly benefited by the

operation. He is unable to reduce the hernia without lying on his back ; this he proceeded to do with success. No more herniæ present.

In the series there was one death.

T. B., æt. 45, admitted September 9, 1901, with left inguinal hernia. Operation, September 10, 1901. Usual oblique incision. There was a lot of fat on inner side of sac, and during the separation of the latter the bladder was seen and exposed. 29 ounces of boric lotion were pumped into bladder and there was no leak. The exposed saccule was distended, and a purse string suture was put around the extra vesical fat, and, when tightened, this pulled the fat over the exposed muscular coats. Radical cure completed by Bassini's method. By the night after operation, the patient had vomited several times, and had retention of urine, which was relieved by catheter. About 10 ounces of normal-looking urine was withdrawn. Morphia, gr. $\frac{1}{4}$, was given. Next day, September 12, 1901, vomiting continued, and he passed no urine until night time, when it was withdrawn with a catheter. Temperature, 100°.

On September 12, 1901, he complained of great pain, and was distended and tender, but resonant in the flanks. He was cold and collapsed. The catheter was again passed and bloody ammoniacal urine was drawn off. Ten ounces of lotion were injected into the bladder and were returned. This was repeated several hours later, and the same amount was returned. The bowels were not moved in spite of rectal enemata, neither was any flatus passed.

He gradually became more collapsed, and died the same evening.

Post-mortem. Belly opened. General septic peritonitis, more in pelvic region. Bladder distended with water. This showed a large hole close to the inner surface of inguinal region. The hole was found to be half inch in diameter, torn and ragged, as if done with the forceps in separating the sac.

OBSERVATIONS ON THE THERAPEUTIC
VALUE OF RADIUM, AND ITS APPLICATION.

By J. M. H. MACLEOD, M.A., M.D., M.R.C.P.,

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Physician for Diseases of the Skin, Charing Cross Hospital, etc.*

AT the present time, when the attention of the public is being drawn to radium in a fashion which may lead to disappointment, and when exaggerated reports of its healing powers are to be found in the daily press, it will not be inappropriate to consider briefly some results which have been accomplished in the past by it, and to review the recent observations which have been published on its therapeutic value and on the best methods of applying it.

Even in the early days of radium, soon after its brilliant discovery by Madame Curie, its therapeutic possibilities were recognised. In 1903, if not earlier, it was known that something emanated from the salts of radium which had an exciting action on living tissues, and that if the radium salt were applied to the tissue in a concentrated form, or for a long period, a destruction resulted somewhat similar to that caused by the X-rays. The three main types of radiation from the radium salt had been distinguished, namely, α , β , and γ rays, but the precise action of these on the tissue was a matter of conjecture.

Through the experiments of my colleague, Dr. Mackenzie Davidson and subsequently of others in this country, it was found that radium had a selective action on certain diseased tissues, and that it acted beneficially on rodent ulcers, small epitheliomata, and lupus vulgaris. At that time the methods of application of the radium were crude. The salt, which was employed, was the bromide, either pure or mixed with more or less barium. This was applied to the skin in a thin glass tube sealed at the ends, or in a depression on a vulcanite button covered by a thin sheet of mica or aluminium, in amounts varying from 5 to 10 milligrammes. Other forms of "applicators" were devised for specific purposes, for example a catheter-like tube holder, made with a malleable metal

extension, was improvised by the writer to apply the radium in cases of cancer of the throat, uterus, rectum, etc.

During the first half of 1904, at the suggestion of my colleague, I tried the effect of radium in a number of cutaneous affections in the Skin Department at Charing Cross Hospital, and, in a paper published in June 1904, advanced the following tentative opinion regarding its therapeutic value, which it will be of interest to quote in order to compare them with the recent developments of the subject. The radium used then was in the form of radium bromide, and radium barium bromide, in quantities of 5 mg. in tubes, and of a radio-activity of 1,800,000 and 600,000, taking the radio-activity of the same quantity of uranium as unity.

"Its chief utility is in the treatment of rodent ulcer, and in the case of small rodent ulcers it acts almost like a charm. In rodent ulcers of a diameter larger than a shilling, treatment by the X-rays is more practical, as the whole of the ulcer can be exposed at once and not piecemeal as with the small quantities of radium at present at our disposal. In some cases of rodent ulcer, which have been subjected to a long series of exposures to the X-rays, the rays seem to lose their effect and the healing process becomes stationary; then exposure to radium may be used with advantage, and the healing again stimulated."

"With regard to cancer, further experience is necessary before any definite statement can be made. It is possible that radium may prove a useful adjunct to surgical treatment. In Lupus vulgaris, radium causes the disappearance of the granuloma and a replacement of it by healthy scar tissue, but, except in very small lesions, the treatment is not at present practical. It is a useful adjunct to the Finsen light and the X-rays, as it can be applied to positions which are difficult to get at, such as about the eyelids and the mucous membrane of the nose. In the verrucose type of Lupus vulgaris it is superior to the Finsen light."

With regard to the permanence of the results, so far as rodent ulcers are concerned, this has been fairly satisfactory. Several of the cases, treated about 1904, which appeared to be healed, have remained sound. In two of them, however, in which no trace of the disease appeared to be left, a recurrence

took place in the scar. In one of these a second series of exposures was given, healing again took place with the formation of an apparently healthy scar, but a relapse has since supervened. In the other, excision was resorted to, and the subsequent history of the case has not been obtained. In this connection, Dr. J. H. Sequeira recently demonstrated, at the Royal Society of Medicine, a case of rodent ulcer of the eyelid cured by radium, in 1904, in which the scar had remained sound since then.

With regard to *Lupus vulgaris*, the early cases have given disappointing results, and recurrences have been usual. In a case of *Lupus verrucosus* of the hand, in a boy, reported as apparently cured, in 1904, a relapse occurred a year later. Radium was again employed with temporary benefit, but, as a further relapse took place, its use was discontinued, and other methods of treatment were employed.

About this time, another field of utility for radium was opened up by the discovery that it had a selective action on blood-vessels causing them to disappear. The writer tried its effect on *Lupus erythematosus*, but the results were disappointing. In connection with vascular *nævi*, on the other hand, the outlook was more promising. The first case of "port-wine stain," treated by radium in this country, was that shown by the late Mr. T. J. P. Hartigan, at the Dermatological Society of Great Britain and Ireland, in January 1904. By means of radium applications, smart localised reactions had taken place, which, on healing, had left patches of pale scar tissue in the midst of the red skin, but, as the blanching had occurred unevenly, the general disfigurement of the lesion was comparatively little reduced.

Since those early days, great advances have been made with regard to the knowledge of the emanations and radiations from radium, their power of penetration, and the best method of applying the agent to the skin, and these advances have resulted in the main from the patient researches of our French colleagues at the Radium Institute in Paris. Perhaps the two most important factors in this advance of knowledge were : (1) the discovery, in 1905, by M. Danlos, that the action of radium was intensified if the salt were spread by means of a varnish on a flat surface, and so applied to the skin, instead of being placed

in a capsule of glass or aluminium, and that, by this means, a much larger surface could be acted upon in an even manner, and (2) the employment of an electroscope, such as that devised by M. Danne, to estimate the radio-activity of the radium specimen to be applied.

In this way, the science of radium therapy has become almost as exact as Röntgen therapy has been rendered by the invention of the invaluable "pastille" by Sabouraud and Noiré. The recent papers and cases, published by Drs. Wickham and Degrais, Dominici, and Bory, demonstrate the immense value of the improved method of applying it.

Mode of Application and Apparatus.—For the details of the mode of application and the apparatus employed by our French colleagues, I take this opportunity of expressing my indebtedness to Drs. Wickham and Degrais for the lucid articles, which they have recently published on the subject. (See list of papers on page 612.)

By means of a special varnish, invented by M. Danne, the composition of which has not been made known, the radium salt is fixed on a flat metal plate, or a piece of stiff linen. This varnish is permeable to almost all the rays, and resists the action of heat, water, vaseline, and antiseptics, such as ordinary solutions of permanganate of potash, and perchloride of mercury, but it is unsafe to expose it to absolute alcohol or ether. The metal plates vary in shape, some being circular, while others are square, oblong, or triangular, and in size from 5 mm. up to 6 cm. square. The pieces of linen vary in size up to several centimetres square. The plates are fixed on handles, some being made to move upon them by means of a pivot. In addition to these, small rods or spheres are employed to carry the varnished radium into cavities. The salt of radium, which is employed for varnishing on those flat surfaces, is the sulphate of radium, which, unlike the bromide, is insoluble. Great care is taken in the spreading and fixing of the salt by the varnish, in order to ensure that it is evenly spread, and that each centimetre of surface has 1 centigramme spread on it. The radium sulphate may be employed pure, *i.e.*, with a radio-activity of 2,000,000, but, more usually, it is diluted by mixing it with barium sulphate, so as to reduce the radio-activity to 500,000 or less. In the choice of the apparatus to be employed in an individual case, not only are the weight of the salt of

radium employed, its radio-activity, and the total dimensions of the surface, over which it is spread, taken into consideration, but also the percentage of the α , β , and γ rays emitted by it.

This mode of application has two advantages over the older method of applying it, first, by it the maximum effect of the radium salts on the tissue can be obtained, certain weakly penetrating rays not being cut off by the screen of glass or mica, and, second, and more important, a much larger radio-active surface is obtained. It has been estimated that, with the radium salt varnished on a flat surface, the effect on the tissue is much greater than if the same amount of salt were applied in a glass tube, and that, with the salt spread out, 1 c.grm. of radium salt of an activity of 100,000 has approximately the same effect as 5 c.grm. of a salt of an activity of 600,000 enclosed in a glass tube.

The varnished surface is not applied directly to the skin, but often with the interposition of a thin layer of gutta-percha to protect it from moisture or discharges, or various screens, consisting of thin aluminium, lead, ebonite, or a layer of wadding 1 cm. thick covered with gold-beater's skin, etc., are interposed to cut off the less penetrating rays. By the latter method several brilliant results have been obtained. The α -rays are the least penetrating, and are cut off by the thinnest sheet of mica, aluminium, or glass, the same substances cut off the softer β -rays, while hard β -rays pass through them. The γ -rays are the most penetrating, and can pass through lead 4 cm. in thickness. It is these highly penetrating γ -rays which have the most powerful selective action on diseased tissues, while the softer, less penetrating rays have a less discriminating destructive effect, and are more potent in causing superficial inflammatory reaction.

For example, in a case of epithelioma of the lip, successfully treated by Dominici and Bory, a circular piece of linen 3 cm. in diameter, with 1 c.grm. of radium sulphate, mixed with 3 c.grm. of barium sulphate varnished upon it, and a radio-activity of 500,000, was applied to the lesion. But between it and the skin were interposed a layer of gutta-percha $\frac{1}{10}$ mm. thick, a sheet of lead $\frac{1}{2}$ mm. thick, 8 rounds of papers, 2 layers of gutta-percha, and 2 pieces of plaster. In this way, the

tumour was subjected to an irradiation exclusively composed of γ rays of an activity estimated at 4,500, and the secondary radiation, produced by the rays passing through the lead, was intercepted by the paper.

In order to avoid getting an excessive action on the surface of raised lesions by repeated or prolonged exposures, Wickham and Degrais have introduced the method of application, which they have graphically named the method of "Feu croisé," and which consists in placing two or more flat "applicators" opposite each other on the tumour, so as to subject the deeper parts of it to the "crossed fire" of penetrating rays from the different "applicators."

It would seem, at the present time, that the more important advantage of the French method of applying radium over the older methods is that, owing to the radium salt being evenly spread over a relatively large area instead of being collected in small bulk in a tube, a larger radio-active surface is obtained with the same quantity of radium, and the total output of rays available to act on the tissue is greatly increased. The presence of a thin layer of mica or aluminium, cutting off the weakly-penetrating X-rays, may yet prove to be no disadvantage, as is seen in Dominici and Bory's case of epithelioma, where only highly-penetrating rays were employed. In this country, till recently, it has been the bromide of radium which has been used for therapeutic purposes, and, as this salt is soluble, certain difficulties are presented in varnishing it on a flat surface. These difficulties can, however, be overcome, short of having the bromide transformed into the insoluble sulphate, by the simple expedient of having the bromide crushed down and evenly spread and pressed between a flat metal surface and a thin mica or aluminium window. In this way "applicators" of different shapes and extent of surface can be constructed in which definite quantities of radium bromide, either pure or diluted in different proportions with varium bromide, are spread over a given surface. I have had such an applicator made and it is giving satisfactory results.

Time of Application.—The time of application of a specimen of radium depends on various factors, such as the radio-activity and amount of the salt applied, the extent of surface on which it is spread, the percentage of the different rays, the presence

of some such screen, as lead or aluminium, between it and the tissue, and the diseased condition for which it is applied. In the early cases, the time was estimated in an approximate manner by applying the specimen of radium to one's own forearm, or to that of the patient, and observing how long it took to produce a mild reaction, and, in estimating the time of exposure in an individual case, Wickham and Degrais still advocate the simple expedient of employing a preliminary tentative exposure of the tissue. Experience has taught certain lessons, however, which are a guide in this matter. It has been found that 5 m.grm. of pure radium sulphate, varnished on a flat surface of 1 c.m. square, when applied directly to the skin for 20 minutes, can produce a severe reaction with ulceration, the same result being obtained by three applications of 10 minutes' duration on consecutive days, and also that 2 c.grm. of sulphate of barium radium of a radio-activity of 500,000 requires an application of 40 minutes at one sitting to cause ulceration.

In the treatment of vascular nævi, a curative effect can be obtained without the production of marked reaction, which, on account of the scar it leaves, is to be carefully avoided, a slight reaction, however, being no disadvantage. Using a flat round plate 6 cm. in diameter, over which is varnished 2 c.grm. of sulphate of barium radium of an activity of 500,000 with 10 per cent. α , 87 per cent. β , and 3 per cent. γ rays, Wickham and Degrais, in the case of pale "port-wine stain," found that the direct application to the skin should be one hour in two seances, while, in the case of deep violet nævi, that it should be two hours in two seances. In the case of raised angiomata, and still more in that of rodent ulcer and epithelioma, the time of application might be safely increased.

On the other hand, when the α and soft β rays are screened off by aluminium or lead, much longer applications may be given, in Dominici and Bory's case of epithelioma, for example, in which all but the γ rays were excluded, and the external radio-activity was only 4,800, an exposure of six consecutive days was given, the radium specimen being applied continuously during that time except at meal times.

It is impossible to lay down hard-and-fast rules with regard

to the time of exposure, and these figures are simply quoted as a guide. The length of exposure, as well as the precise method of application in a case, are subjects of such infinite importance, both with regard to the permanence of the result and the cosmetic appearance of the scar, and vary so much in different cases that they must be left largely, as in the case of the X-rays, to the experience and judgment of the operator.

Action of the Radiations from Radium on Diseased Tissues.—

The rays from radium have a selective action on certain diseased tissue elements, affecting them much more powerfully than they do healthy tissue, and eventually causing their destruction. The types of cells, on which they have the most marked action, are the comparatively weakly resistant cells of rodent ulcer, and various other pathological conditions of the epidermis, such as epithelioma of the skin and warty growths. Their destructive action has also been proved to be great in the case of the cells of epithelioma of the lip and mouth. On the cells of cancer, growing from the epithelium of the œsophagus, uterus, bladder, etc., the destructive action on the diseased tissue has not been so marked, but this may be regarded, quite reasonably, as due to the difficulty of reaching such growths, of watching and controlling the applications, and to the great rapidity of the malignant proliferation in these situations, as compared with that which occurs in rodent ulcer.

In the case of granulomatous cells, such as those of tuberculosis cutis, the destructive action of the rays, though definite, is considerably less than on pathological elements of epidermal origin, and in this they closely correspond with that of the X-rays. This is probably dependent on the fact that the effect of the rays is greatly diminished by having to pass through the epidermis, and suggests the application of long exposures to highly penetrating rays. The rays have also a definite and selective action on blood-capillaries, destroying them, and hence their value in the treatment of angiomata. This action, according to the researches of Dominici and Barcat, is brought about in the following manner. The white fibrous and elastic tissues of the corium and blood-vessel walls disintegrate, and, at the same time, the fixed cells undergo a reversion to an embryonic state. In this way, the angiomatous tissue is re-

placed by numerous embryonic cells with a few contracted capillaries and blood spaces among them. By the proliferation and evolution of these embryonic cells, a new and healthy connective tissue gradually becomes built up.

All three types of rays act on the skin, the harder and more penetrating the rays the more selective the effect. The soft weakly penetrating rays, such as the α and soft β rays, tend to cause superficial destruction, and hence the advisability of cutting them off in all cases in which it is important to avoid ulceration and subsequent scarring.

Another definite effect of the radium rays is that on the sensory nerve terminations, for, like the X-rays, they not only allay itching, but also relieve pain. The bactericidal action of the radium rays is slight and is probably dependent on the α rays.

At the time of application of the radium, no definite sensations or signs of inflammation are produced, and it is, as a rule, only after the lapse of 10 to 14 days that the characteristic reaction sets in. This is associated with all the signs of inflammation, which may be limited to the lesion itself, or, if a powerful reaction occurs, it may spread to the neighbouring skin. In a marked reaction, oozing takes place, and a scale, or more or less firm scab, forms, in some cases not unlike a rupial crust, which separates naturally in two to four weeks, when another scab may form, or the lesion may have dried up and appear to be completely healed. When the application has been excessive, signs of reaction may appear much earlier, and erythema may be noticed in 24 hours. Vesicles then appear which dry up to form a scab, which falls off in a week or ten days, leaving a superficial ulceration. This heals slowly, leaving a scar which is red, smooth, and presents telangiectases like the scar of an X-ray burn. The radium reaction is probably the result of an inflammatory process caused by the toxic effect of the dead tissue elements, which have been killed by the rays, acting on a tissue partially devitalised by the same rays.

In addition to the rays, which are given off by the radium, emanations in the nature of a gas are also emitted, which confer radio-activity on substances with which they come in contact. These emanations may play an important part in the future developments of radium therapy.

Diseased Conditions which have been cured or benefited by

Radium.—So far the field of utility of radium in the curing of disease has been a limited one, and it is in the case of certain skin affections, such as rodent ulcer, epithelioma, keloid, and various forms of vascular nævi, that the most striking results have been obtained.

Rodent Ulcer.—In the experience of almost everyone, who has employed radium for the treatment of rodent ulcer, there is no remedy which gives such brilliant results as it does. Having applied it at Charing Cross Hospital and in private practice, since 1904, in a considerable number of cases with the comparatively small quantity of radium at my disposal, I can fully endorse this view. Relapses have certainly occurred in several cases, but they have been either in cases of such an advanced type, involving large areas and extending down to bone, that the quantity of radium was inadequate to thoroughly deal with them, or in which the exposures were insufficient, and the patient, failing to report himself when recurrence showed itself, allowed the disease to assume serious developments before being seen again.

There appears to be in the radiations from radium something which is more selective in its action on rodent ulcer than the rays from an X-ray tube, for cases, in which healing has gone on up to a certain point with the X-rays and come to a standstill, have begun to heal again when radium was applied.

Epithelioma.—Epitheliomata of the skin are also capable of being cured by radium, though not so easily as rodent ulcers, since the cells composing them appear to be more resistant to the radiations than those of rodent ulcer.

Several cases have been lately reported, in which epitheliomata of mucous membranes, such as the lip and tongue, have also resolved under this treatment. This is an observation of great importance, as it is a general experience that the X-rays have a feeble action on this type of growth. In the case already referred to, which was recently published by Dominici and Bory, an epithelioma of the lower lip, the size of a 5-franc piece in a man, aged 67 years, was cured by means of radium. The treatment was begun on the 9th January 1908, and, by the 25th February, it had gradually receded till nothing was left but a supple cicatrix which was slightly indurated towards its outer angle.

Vascular Nævi.—All forms of vascular nævi have been treated, more or less successfully by radium, and the statistics, published by Wickham and Degrais, based on 101 cases, show that, by this treatment, results can be obtained which are superior to those obtained by any other means at present at our disposal.

By weak doses of radium, frequently repeated, raised angiomata completely dry up and become decolourised, leaving a pale, supple scar, and this can be accomplished without the production of any marked reaction. This method has a great advantage over excision, electrolysis, and the actual cautery, since it is painless, and can be done while an infant is asleep.

It is in "port-wine stain," however, that the most striking results have been obtained, for, up to now, these lesions have been the despair of surgeons, and any treatment adopted, if successful in destroying the nævoid tissue, usually resulted in the production of scarring, which was as disfiguring as, if not more so, than the disease. By means of repeated doses of radium, just sufficient to produce a slight reaction, and no more, the red or purple tint of the nævus has been greatly diminished and the colour gradually reduced, so as to approach that of the surrounding skin, without the production of a scar. These results have been obtained by Wickham and Degrais, not only in superficial nævi, but in those in which the whole thickness of the cheek was involved. Of course a treatment such as this, to be successful, requires great care and experience, and, if the nævus is extensive, occupies a considerable time, as the whole diseased surface may have to be gone over repeatedly, piecemeal.

Pigmented and Hairy Moles have also proved to be amenable to some extent to this form of treatment, with the destruction of the hairs and the diminution of the pigment.

Seborrhoic Warts and Papillomata resolve under it, as they do in most cases under the X-rays.

In the case of deep-seated *cancer*, my experience at Charing Cross Hospital has so far been disappointing, and all that has been accomplished has been to relieve pain to some extent, and to retard, but not arrest, the progress of the disease. It is unfair, however, to base any conclusion on these results, as the amount of radium employed was insufficient to effectively deal

with the diseased tissue. Recently, several cases have been reported from Paris, in which striking improvement was obtained, but it is too soon to judge of these results, and it is well, while continuing experiments, to keep an open mind on this all-important subject. Still, the outlook, where the lesion is so situated that the radium can be applied satisfactorily, and a sufficient quantity of radium is available, is distinctly encouraging.

Tuberculosis Cutis.—With regard to the treatment of the various forms of *Lupus vulgaris*, our experience with radium has been disappointing. It was found possible to cause the apparent disappearance of nodules of lupus by the radium, but in nearly every case recurrence supervened. In the case of lupus, affecting the mucous membrane of the nose and mouth, temporary improvement occurred after applying radium, but relapse quickly took place. This was specially disappointing, as those situations, being difficult to reach by other methods of radio-therapy, seemed admirably suited for radium treatment. The best results were obtained in the case of *lupus verrucosus*, but even in this, although it caused the warty superstructures to disappear, and apparently cured the underlying granuloma, the improvement was only temporary. The action of radium in lupus somewhat corresponds with that of the X-rays, and so far is not comparable, in its efficacy, with that of the Finsen light.

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ON THE DIAGNOSIS OF TRANSITORY
HEMIPLEGIA IN ELDERLY PERSONS.

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So far as I have been able to ascertain, the theory that spasm of the cerebral blood-vessels may produce paralysis was first advanced by Bastian, in 1875, though he did not cite any cases in support of his opinion, or define what kind of paralysis might be so produced. In 1887, Daly recorded a case of recurring transient attacks of aphasia and right hemiplegia in a man, aged 68. The attacks, which began and ended suddenly, had a duration of from five minutes to three hours. Daly concluded his report with these words, "As these attacks came on and passed off so rapidly, the case seems more readily explainable as due to spasm of the sylvian artery than to thrombosis or any other cause." However, neither the class of case described, nor the theory advanced attracted any attention for some years.

It was in connection with the attempts made by Savill in 1897 and by W. Russell in 1901 to separate a condition of "hypermyotrophy" and "arterio-sclerosis" from one of "atheroma," that the latter pointed out that persons affected by arterio-sclerosis might suffer from temporary cerebral disturbances. During these attacks the pulse gave evidence of increased hypertonus, and, if this were lessened by treatment, the cerebral phenomena disappeared. In support of this opinion, Russell has reported cases of somnolence, coma, delirium, restlessness, insomnia, aphasia, and hemiplegia. Similar cases have been reported by Langwill, Stengel, and myself.

Before discussing the diagnosis of such cases, I will give accounts of four additional ones which I have seen recently.

Case 1.—A. B., aged 47, a non-smoker and abstainer, with no physical signs of cardiac, arterial, or renal disease, experienced late one evening, after a day's hard mental work, a sensation of numbness "coming and going in waves" and slight loss of voluntary control, in the right arm and hand. On examination, it was found that speech and all gross voluntary movements of the limbs were normal; the finer movements of the right hand

and fingers were a little fumbling. Sensation was intact. The biceps and triceps jerks were present and brisk in the right arm, absent in the left. Slight rectus- and ankle-clonus could be elicited in the right leg, but not in the left. Both plantar reflexes were flexor in type. As estimated by the fingers, there was no diminution in the calibre of the radial arteries, nor any increase of blood-pressure. On ophthalmoscopic examination, the size of the retinal arteries appeared to be the same in the right and left eyes.

The patient was given some whisky and hot water and sent to bed. Next morning, the paræsthesia, very slight motor defect, and increase in the tendon jerks on the right side, had all disappeared. The systolic blood-pressure was 130 mm. Hg., and the radial arteries were found to be in the same condition as on the previous evening.

Case 2.—J. B., aged 59, was admitted under myself to the Bristol Royal Infirmary, on October 6, 1907, suffering from aphasia and right hemiplegia. Two years previously he had had a similar attack, also without loss of consciousness, and equally transitory, and had been an in-patient under Dr. Waldo. On examination of the patient, on the following morning, I found that his right leg was distinctly weaker than the left; otherwise, the paralysis had disappeared. Speech was normal, though slow. The knee-jerks were brisk and equal, both plantar reflexes were flexor, no elbow-jerks were present. The cardiac apex was in the fifth intercostal space in the nipple line, and the first sound at the apex was accompanied by a low vibratory non-conducted murmur. The systolic blood-pressure was 145 mm. Hg.; the superficial arteries were thickened and tortuous. The urine was normal. Twenty-four hours later the paralysis had quite disappeared, and the man went out.

Case 3.—F. C. H., aged 55, was brought to the Bristol Royal Infirmary on the morning of May 29, 1907, unable to move the right hand or foot, or to speak, though, apparently, he was fully conscious. It was subsequently ascertained that the paralysis had come on quite suddenly that same morning, and also that the patient had suffered on and off, for the preceding five years, from pallor and numbness of the 2nd, 3rd, and 4th fingers of the right hand. On examination, about three hours after the onset of the paralysis, it was found that the patient was fully conscious, but suffering from motor aphasia and a right hemiplegia involving arm and leg, but not face or tongue. No tendon jerks were present in the arms. The right knee jerk was brisker than the left, but neither rectus- nor ankle-clonus was present. The right plantar reflex was absent, the left present and flexor in type. Arterio-sclerosis of a moderate degree was present. The systolic blood-pressure was 160 mm. Hg. The heart was normal. By the following day, the hemiplegia had quite disappeared; the retention of urine which accompanied the hemiplegia lasted one day longer. Four days subsequently the right knee-jerk was still a little sharper than the left, and both plantar reflexes were flexor. During the ten days that the patient stayed in the Infirmary, the systolic blood-pressure was constantly 160 mm. Hg.

Case 4.—An old lady, who recently died, aged 92, suffered during the last eight months of her life from frequent cerebral disturbances, evidenced by motor aphasia, or left hemiplegia, or giddiness, or this with mental

confusion. Each attack lasted from 24 to 36 hours, and began, as a rule, in the early morning; she woke up paralysed. It was invariably found that such attacks were associated with a cord-like condition of the radial artery, and an incompressible pulse. The administration of nitro-glycerine— $\frac{1}{4}$ gr. of the liquor every ten minutes—brought about, in five or six doses, a relaxation of the arterial hypertonus, and, as soon as this occurred, the cerebral paralysis rapidly grew better and disappeared. If the nitro-glycerine were then omitted altogether, the hypertonus recurred within two or three hours, and the paralysis again appeared. It was found necessary to continue the nitro-glycerine in just sufficient doses to keep the radial artery relaxed for a period of from 24 to 36 hours, at the end of which time the hypertonus gradually ceased to recur, and the patient no longer tended to relapse.

There was no obvious physical cause of these paralytic attacks; they were not preceded by any constipation, nor excess in diet, nor by gastrointestinal disturbance. It was, however, noticed by the patient's nurses, that such paralyzes were particularly apt to follow psychical disturbances, little worries, or frights. In the intervals between these attacks, the patient was bright and fairly active, walking about the garden, and going out for a drive every day.

The physical signs of a hemiplegia were a flaccid paralysis of the arm and leg, with increased tendon jerks, the plantar reflex on the paralysed (left) side was temporarily lost, whilst that on the sound (right) side remained flexor in type. During an attack of mental confusion and giddiness, or giddiness only, no change occurred in the tendon jerks or plantar reflexes. Such attacks followed much the same course as those of hemiplegia.

Six days before her death, the patient was suddenly seized with an incomplete right hemiplegia, affecting arm and leg, but not face, tongue, or speech, and this was accompanied by mental torpor. The radial arteries became cord-like, and the pulse incompressible. The right plantar reflex was found to be extensor in type, the left remaining flexor; and the right knee-jerk was sharper than the left. No elbow jerks were present in either arm. The administration of nitro-glycerine made the pulse soft, but the paralysis persisted. Three days subsequently Cheyne-Stokes breathing began to appear at irregular intervals, the patient gradually lapsed into a comatose condition, and died two days afterwards.

During these eight months she had had two attacks of left hemiplegia, six attacks of aphasia, three attacks of vertigo, and three of vertigo and mental confusion.

On consideration of these cases, it is seen that temporary attacks of aphasia, or aphasia and right hemiplegia, or left hemiplegia, or vertigo, or mental confusion, may be associated with (1) no arterio-sclerosis, no general hypertonus, no rise in B.P., *e.g.*, Case 1; or (2) arterio-sclerosis, but no general hypertonus or rise in B.P., *e.g.*, Case 3; or (3) arterio-sclerosis, general hypertonus and rise in B.P., *e.g.*, Case 4. The theory of a localised hypertonus, an arterial spasm, in cerebral blood-

vessels affords an adequate explanation of these various cerebral phenomena. It accounts for their often sudden appearance, and for their equally sudden and complete disappearance.

Such arterial spasm may apparently be limited to one or more cerebral arteries, or may form a part of a more general vascular constriction. In the latter case, it must be supposed that it is more marked in cerebral than in other arteries.

Such a theory may be supported by the following arguments:—

1. It is recognised that localised arterial spasm may occur in parts of the body other than the brain; for instance, in the extremities, in Raynaud's disease. In a few recorded cases of that disease, notably in two of Osler's, attacks coincided with the occurrence of various temporary cerebral phenomena exactly similar to those described here, and in a former paper,—convulsions in the one case; dizziness, aphasia, right hemiplegia, and left hemiplegia in the other. In this connection, it is interesting to note that slight symptoms of Raynaud's disease occurred in Case 3.

2. In some cases, *e.g.*, three of Stengel's and one that I published previously, the paralysis may be preceded by clonic spasm in the subsequently paralysed limb, or the attack may consist of clonic spasm only. Such phenomena resemble the unilateral clonic spasms which can be produced by digital compression of one carotid artery, and the general convulsions which may occur in Stokes-Adams' disease, as the result of too long an intermission between the auricular and ventricular contractions.

3. In some cases, *e.g.*, some of those published by Russell, and Case 4, there may be a most striking parallelism between the state of the radial artery and the cerebral phenomena.

4. It was formerly thought that the cerebral arteries had no vaso-motor nerve supply, but the recent experiments of Wiggers show that vaso-constrictors are present. Arterial constriction may, therefore, be the result of impulses passing through these fibres.

The accurate diagnosis of such cases is of importance, as there is a danger that they may be mistaken for cases of cerebral hæmorrhage or thrombosis. If the phenomena are of a recurring nature, and a patient is seen in a second, or

subsequent attack, diagnosis is not very difficult, and need not be discussed. But in a first attack, diagnosis may be most difficult, if not impossible.

The state of the tendon jerks and skin reflexes is of some importance. I pointed out, in a previous paper, that, in cases of hemiplegia presumably due to arterial spasm, the plantar reflex did not become extensor in type, but, on the contrary, disappeared temporarily; and the important question arises whether this feature marks off such cases from those due to hæmorrhage, thrombosis, or uræmia. Unfortunately, for ease of diagnosis, it does not. Collier, in a paper on the plantar reflex, reported that, of 36 cases of hemiplegia, 28 had an extensor reflex on the paralysed, and a flexor reflex on the sound side; 3 cases had an extensor reflex on both sides; 1 case had no reflex, either flexor or extensor, on the paralysed side, and a flexor reflex on the sound side; and 4 cases (in one of which the leg had entirely escaped paralysis) had a flexor reflex on both sides. All that can be said, then, is that, if the plantar reflex is extensor in a case of suddenly occurring hemiplegia, the cause is an organic one; if not extensor, the disease may be, though exceptionally, of organic origin, or it may be due to vascular spasm. Again, the absence of any plantar reflex on the paralysed side does not serve to differentiate the cases, for this may occur not only in these transitory cases, but also, though exceptionally, in organic cases.

A similar uncertainty attends any deduction drawn from the state of the tendon-jerks; they may be increased or not in these transitory cases, just as they may be in cases due to an organic vascular cause or to uræmia.

The onset of hemiplegia, due to vascular spasm, is usually unattended by loss of consciousness. This feature, it might be thought, would serve to separate these cases from those due to cerebral hæmorrhage, it being generally held that cerebral hæmorrhage, unlike thrombosis, is attended by loss of consciousness. But the recent statistical enquiry by Jones shows that "consciousness is lost at its onset in half the cases of occluding lesions, and three-quarters of hæmorrhage lesions. It is transitorily affected in many of the remaining cases. . ." Consequently the absence of loss of consciousness does not serve to differentiate arterial spasm cases from either

hæmorrhage or thrombotic cases. Further, in one case of Stengel's, and in one of mine, some attacks were attended by transitory loss of consciousness.

Hemiplegia, due to vascular spasm, is in some, but not in all cases, attended by a rise of blood pressure. Thrombosis is not so attended; cerebral hæmorrhage, if at all large, is accompanied by a very great rise in blood pressure (Janeway), far greater, in all probability, than ever takes place in cases due to vascular spasm. Acute uræmia, too, is accompanied by a rise in blood pressure (Janeway).

It has to be confessed, then, that the differential diagnosis of a first attack of hemiplegia, due to vascular spasm, from one due to thrombosis, or hæmorrhage, or uræmia, is very often extremely difficult.

Uræmia exceptionally produces a hemiplegia; such cases have a close resemblance to those due to cerebral hæmorrhage, for which they are often mistaken. Cerebral hæmorrhage, of itself, may cause the presence of albumen in the urine, and is often superimposed on a chronic Bright's disease with hypertrophied heart and high blood pressure. In the absence of a clinical history of the period preceding the attack, diagnosis between these two conditions is generally impossible. Both are, as a rule, attended by loss of consciousness, often lasting, and by a very high blood pressure, and, in these two features, are very different from cases due to vascular spasm.

This question of diagnosis is not merely one of academic interest, it is of great practical importance. For though vaso-motor dilators will rapidly cure a case due to vascular spasm, it is the very worst treatment for cases of thrombosis or hæmorrhage. In the former condition, vaso-dilators will tend to slow the blood current in the cerebral arteries and thus favour clotting; in the latter condition, it will lower the intracranial pressure. Cushing has shown that the rise of blood pressure, which takes place in cerebral hæmorrhage, is protective, it keeps up the circulation in the medulla; and if this is lowered, either by venesection, or by the administration of vaso-dilators, the patient's death may be brought about. On the other hand, in uræmia, venesection or spinal puncture is the best treatment.

Paroxysmal vertigo, due to vascular spasm, may be con-

founded with lithæmic vertigo, a condition which, though described by Murchison, seems to have quite dropped out of the knowledge of the profession. It is a most distressing complaint, usually of sudden onset, and often compels a man to lie absolutely flat for hours or days, afraid to raise his head owing to the increase of giddiness thereby caused. Some cases are cured by mercury, as stated by Murchison; others, curiously enough, are unaffected by mercury, but are rapidly cured by podophyllin.

The ultimate prognosis of vascular spasm cases, if of a recurring character, is not good; they may end in permanent palsy due to cerebral softening. Russell has recorded two fatal cases of softening which, he says, support the view that they so terminate; the clinical histories given, however, do not state that paralyzes had occurred previous to the fatal seizures. In Case 4, recorded above, the sequence of events appears fairly conclusive, five days before death a paresis of the right side occurred, attended by an extensor plantar reflex, and unaffected by vaso-dilators. This was probably due to cerebral softening.

The treatment of such cases is easy. Experience shows that the administration of vaso-dilators, in quantity sufficient to make the pulse quite soft, will rapidly cure the condition. Probably, too, it postpones the day of permanent paralysis, though, as shown by Case 4, even if most experienced nurses, fully acquainted with the associated changes in the pulse and the necessary treatment, are in charge, it is not always possible to prevent it.

Bastian: *On Paralysis from Brain Disease*, 1875.

Collier: *Brain*, 1899, Vol. 22.

Cushing: *Johns Hopkins' Bull.*, 1901.

Daly: *Brain*, 1887, Vol. 10.

Edgeworth: *Scott. Med. and Surg. Journ.*, 1906, Vol. 19.

Janeway: *The Clinical Study of Blood Pressure*, 1904.

Jones: *Brain*, 1905, Vol. 28.

Langwill: *Scott. Med. and Surg. Journ.*, 1906, Vol. 18.

Murchison: *On Functional Derangements of the Liver*, 1874.

Osler: *Amer. Journ. Med. Sc.*, 1896, Vol. 112.

Russell, W.: *Lancet*, 1901; *Brit. Med. Journ.*, 1906; *THE PRACTITIONER*, 1906; *Arterial Hypertonus, Sclerosis, and Blood Pressure*, 1907.

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ACUTE APPENDICITIS.

1. SHOULD APERIENTS OR SEDATIVES BE ADMINISTERED IN THE EARLY STAGES OF THE ATTACK? AND
2. SHOULD HEAT OR COLD BE APPLIED LOCALLY?

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Should Aperients or Sedatives be Administered?—The discussion of the subject is rendered somewhat difficult at the outset, because the action of all aperients is not the same. Thus, those which cause evacuation, by increasing intestinal peristalsis, must be regarded as essentially different from those which effect a like result by increasing, more or less exclusively, intestinal secretion. And the difference is of considerable importance in its bearing upon the particular aspect of the question under discussion, for it may be said that the use of the one or the other determines the action taken by many in regard to the attitude they assume towards the employment of opening medicines. Fortunately, as concerns sedatives, the same difficulty of differences in drugs hardly exists, and those who advocate their employment, use, almost without exception, opium, or some of its derivatives, morphia, heroin, etc. It must be understood that the mere relief of pain is not at present under consideration. The drug is supposed to be administered as a curative agent, or as a prevention against further complications. And the two-fold part which it is assumed it plays in the rôle is, first, that it is anti-phlogistic, and, therefore, a preventive of further inflammatory extension; and, second, that, by inhibiting peristaltic action, the parts in immediate proximity to the inflamed appendix are kept quiescent, and protective adhesions favoured in their formation.

Advocates of the use of aperients object to the use of sedatives on both pathological and physiological grounds. First, they deny that the early formation of adhesions is ever protective against the advance of the disease in fulminating cases, such as gangrene and acute perforations; that,

indeed, adhesions only form in the less critical cases, and are the result of a gradual extension of inflammation from the canal of the appendix itself, and, even if suppuration is to ensue, they will probably continue to form irrespective of whatever measures are employed. They further contend that, whatever may be the anti-phlogistic properties of the drug, these are more than counterbalanced by the probable congestion of the area at the seat of disease induced by stagnation of the fæces in the cæcum and possibly lower ileum. Another contention put forward in opposition is that, inasmuch as opium checks secretion, any toxins, formed as the result of a septic appendicitis, are retained in the body, and thus a complication is added which may possibly prove graver than the local disease itself. But perhaps the most cogent objection which is offered is that which accuses the drug of masking the symptoms to such an extent that a fatal issue may be slowly advancing while the patient, to all superficial appearances, is supposed to be recovering. That this accusation is true few surgeons, I fear, will be able to deny. It requires sometimes a very close, critical, and experienced observer to see how insidiously a fatal toxæmia is advancing through the belying influences exercised as the result of the administration of morphia. It is not easy sometimes to diagnose, at the outset, a gangrenous appendicitis, and the difficulty is enormously enhanced, if, indeed, the fatal tendency of the disease is not actually increased, by the giving of opium in some of its forms. It would seem, therefore, as if the opponents of the use of opium and its derivatives had, in this last argument, a plea that wholly outweighed all the advantages urged by its advocates. To those who administer morphia with the sole object of relieving the acute pain at the outset of an attack, few would take exception, because it is definitely given for no other purpose than to effect the special object in view, and with the very distinct understanding that they are keenly alive to the possible advance of the disease, irrespective of the drug's purely soothing influences.

Reverting to the advocates of aperients, it has been already indicated, in weighing the *pros* and *cons* for the use of sedatives, what are claimed as some of the advantages of obtaining a

free action of the bowels. The chief among these, it may be repeated, is the relief of any congestion of the parts about the region of the inflamed appendix. It was contested, in reply to the adverse criticisms, that movement of the parts inhibited the formation of adhesions, and so favoured a dangerous extension of the disease, that pathology taught that the really dangerous cases were those in which perforation or gangrene took place at an early stage of the disease, before it was possible, in any circumstances, for adhesions to form, and that, when adhesions did form, it was a comparatively slow process due to extension from influences commencing within the appendix itself. But the congestion of the affected area, it is contended, may be relieved without much peristaltic movement of the bowels in the immediate neighbourhood of the appendix; and herein possibly lies the difference of value which may be attached to the various kinds of aperients. If there is any truth in the contention of those who advocate the use of sedatives, that rest to the parts is necessary for security, then drugs, which cause active and painful peristalsis, should give place to those whose special peculiarity is to evoke more or less watery evacuations, by stimulating an abundant intestinal secretion. This kind of aperient still further fulfils the best aims of the advocates of opening medicines, because excessive secretion has probably a very powerful depletory effect upon the congested and inflamed parts. The agents, therefore, which seem best to accomplish the ends desired, are salines.

If I venture, in concluding the discussion of this particular aspect of the question, to promulgate, and express in concrete form, what I personally believe to be the right course to pursue in the early stages of cases of acute appendicitis—it being understood that immediate operation is left for the moment out of consideration—it would be to give $\frac{1}{4}$ gr. of morphia hypodermically, in order to assuage the acute pain, and to commence at once the administration of drachm doses of sulphate of magnesia given every hour until the bowels move.

Should Heat or Cold be used as a Local Application to the Iliac Region?—Precisely the same difficulties are encountered, in weighing the respective merits of heat and cold as therapeutic agents, as existed in the case of internal administrations,

when considered from the point of view of curative measures. That is to say, the uncertain progress of the disease renders it impossible to conclude whether a given result, good or bad, can be justly attributed to the particular application employed. The fervour with which some advocate the use of ice, and the equal ardour with which others advise hot fomentations or poultices show how extreme are the differences of opinion on the subject. While, therefore, experience can lay no stronger claim for the employment of one application to the exclusion of the other than is allowed it can do, in the case of internal administrations, it becomes necessary to submit the discussion of the subject to investigations based on similar lines to those previously employed, and to enquire into the supposed action of each agent, and its pathological and physiological bearing on the diseased part. The answer to the question is then made to depend, at least, upon a reasonable basis, and to offer some justification for the adoption of any particular method.

As the distance is not great between the skin covering the iliac region, and the cæcum, and the appendix lying in that region, it may, I think, be reasonably assumed that the application of either heat or cold to the iliac skin will raise or lower the temperature throughout the entire involved area. If this direct action could not be entertained, a more complex physiological process would have to be admitted, and it would be necessary to consider the question of reflex vasomotor action, whereby the deeper vessels of the part might be dilated or contracted, and the pathological process inhibited or stimulated. It is possible, however, that, whether the action of heat or cold be considered in either direct or indirect relation to the seat of disease, the ultimate result is much the same; in other words, that a reflected nerve influence would effect a similar action upon the deeper tissues as would the direct transmission of cold or heat to the part.

There are three primary aspects under which the influences wrought by the application of heat and cold may be viewed. First, the effect upon the nerve supply; second, upon the arterial supply; and third, upon the micro-organisms and the tissue cells.

The effect of extreme cold upon the nerves, such as that

which would be produced by the application of a rubber bag containing ice to the region, would be to numb the sensation of the part, and, in consequence, to help to allay the pain. It would cause contraction of the vessels, diminish thereby the activity of the circulation, and, therefore, retard the process of inflammation. It would check the growth and multiplication of the septic micro-organisms, but, at the same time, diminish the increase and activity of the phagocytes and other protective tissue cells. Thus, all that could be reasonably inferred from the action of extreme cold would be that pain was lessened, and the morbid process retarded so long as the lowered temperature was maintained, the actual meaning of which amounts to little more than that a temporary retardation of the disease ensues. The real focus of the disease remains; the micro-organisms have been neither killed nor removed from the region; and, if Nature is to cure the disease by her own unaided efforts, she has been hampered and not helped.

In comparison with cold, heat may be said to exert the following influences. Like cold it lessens pain, but probably in a different way. Through its relaxing influences upon the various tissues, it diminishes tension in the inflamed area, and so lessens abnormal pressure on the nerves, and, further, the well-known simple soothing effect of heat may act directly upon the irritated nerves, and relieve the acuteness of sensation.

The most important effect of heat is exerted through the agency of the circulatory system. It leads to a comparatively widespread dilatation of the vessels, and so to the relief of local congestion. In this particular process may probably be found the most cogent factor in deterring the advance of the disease. It admits of a freer circulation of blood through the part, and hence to an increased excitation of the normal tissue changes. Nature, by throwing up a barrier of phagocytes and antitoxins, checks the advance of the microbic onslaught; and, if these agencies can be encouraged and reinforced by a continuous supply of fresh blood circulating through the field of battle, it is possible for the advance of the disease, to be not only inhibited, but actually cured. We may even go a step further, and say that the increased circulation in the part may prevent the accumulation of effete and injurious products, the

result of the conflict, by assisting in their rapid excretion and elimination from the system.

Thus, on the basis of the foregoing remarks regarding the supposed physiological action of cold and heat, the most reasonable deduction seems to be that, while both agents may lessen local pain, heat has the additional advantage of very probably assisting in mitigating the progress and extension of the disease.

As a clinical question, it may be asked in what form is heat best applied? The choice lies practically between fomentations and poultices. In view of the possibility of subsequent operation, poultices, made from the customary ingredients of linseed meal and bread, can be deemed hardly suitable. Nevertheless, there is no question that their greater power to retain moistures and heat renders them particularly agreeable to the patient, for there is not the same need to be frequently changed, and they are often more easily and readily obtained.

In conclusion, it must be owned that an element of weakness underlies all the reasoning that has been employed in discussing both internal administrations and external applications. If every statement were based on indisputable facts, every conclusion might be accepted as true, but it is largely a matter of speculation regarding both the actual processes at work in the progress of the disease, and the influences exercised by the employment of any particular agent. Theory, unfortunately, throughout all the details of the discussion, takes a more prominent place than fact does, and we are at best only permitted to express an opinion, and not to lay down laws. Thus, then, in attempting to answer the two questions which form the main subject of these few remarks, I can only venture the length of saying that—leaving out of consideration the question of operation—I believe that the early stage of acute appendicitis is best treated by:—

1. The administration of small doses of saline aperients repeated frequently until the bowels move;
2. The local application of heat to the iliac region; and
3. The subcutaneous injection of a small dose of morphia for the *sole* purpose of relieving the immediate acuteness of the pain.

VARIATIONS OF ARTERIAL BLOOD-PRESSURE IN
CASES OF ARTERIO-SCLEROSIS.

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THE diagnosis of arterio-sclerosis,¹ apart from certain cases of raised arterial blood-pressure, which afford valuable evidence of early arterial changes, is, generally speaking, only made when the condition is obvious by aid of the finger and the eye. The result is that, when the disease is brought to our notice, we can at best hope for little more than to retard its progress.

It would seem, however, to be a matter of high importance that the physician should be able to detect, in its early stage, the process which leads to arterio-sclerosis, a much-to-be-desired result, which may possibly be achieved by studies of the alterations in function of the arteries in this pathological condition or conditions. It was with this end in view that I undertook the investigation, the results of which are set forth in this paper, an investigation, in which the effect of certain physiological conditions which cause vascular dilatation or constriction, and, in consequence, corresponding alterations in blood-pressure were studied. These physiological conditions were, in the first place, variations in the time of day, at which the observations were made, in the second, alterations in the position of the patient (recumbency, sitting, and standing), and, in the third, the effects due to the ingestion of food. Furthermore, corresponding determinations of the internal calibre of the radial artery, due to change of position of the patient, as well as at different times of the day, were made.

In addition to the observations on the arterio-sclerotic cases, a certain number, which presented no signs of arterial disease, were observed in order to afford a basis of comparison with the others. A few words in reference to the literature will be not out of place.

As regards diurnal variations: Oliver² finds that "vaso-

¹ By the term arterio-sclerosis I wish to imply, for the purposes of this paper, simply thickening of the arterial wall, as recognised clinically by the finger.

² G. Oliver: *Blood and Blood-pressure*, pp. 192, 193.

motor tone is at its maximum in the morning, and at its minimum at night, and, as it diminishes, the arterial blood-pressure is maintained by the increased output of the heart." He says that "as the day advances, the maintenance of the arterial blood-pressure depends more and more on the cardiac muscle, the diminution of pressure, which would have resulted from the uncompensated waning of vaso-motor tone, being more than counterbalanced by the gain induced by the more powerful and more frequent ventricular contraction increasing the output of the heart."

In regard to the influence of posture, the same observer¹ says that "the blood-pressure is higher in the erect posture (standing and sitting) than in recumbency, and that "of the two erect postures, standing provides the higher reading, but the difference is, as a rule, less between them than between sitting and recumbency." He further finds that "the postural differences in the blood-pressure are due to variations in muscular contraction, in the vaso-motor tone, and in the cardiac output." The postural rise of pressure has been referred to over-compensation on the part of the vaso-motor mechanism. Oliver, however, doubts whether this can be the sole cause, and considers that "muscular contraction (in the form of cardiac stimulation and increased output of the ventricle) must be a factor."

Janeway² says that "the weight of evidence seems to point toward the recumbent posture as conducive to the lowest pressure, standing and sitting being alike in raising, both systolic and diastolic pressures, 5 to 10 millimetres." Erlanger and Hooker found the pressures about the same, sitting or lying, but on standing, diastolic pressure rose much more than systolic.

In regard to variations in the calibre of the arteries, Oliver³ finds that "physiological variations of the calibre of the arteries generally coincide with those of the arterial blood-pressure," but that "the clinical relation between the arterial blood-pressure, when increased above the normal range, and the calibre is generally the reverse of the physiological." He

¹ *Ibid.*, pp. 151-154.

² *The Clinical Study of Blood-pressure*, pp. 115, 116.

³ *Blood and Blood-pressure*, p. 244.

says that ¹ "as a rule, in healthy subjects, the postural variation extends from .4 to .6 mm., the average calibre in the erect postures being from 2 to 2.3 mm., and in recumbency 1.5 to 1.8 mm."

Finally, as regards the effect of digestion. Oliver² states that "the mean arterial pressure . . . is raised by the mean intake of solids or liquids," also that "during the first stage of the digestive process (about half an hour) the arteries contract, and the mean arterial pressure continues to be raised . . .," further, that "the lowering effect on the arterial blood-pressure induced by the determination of the large volume of blood to the splanchnic area, during the early stage of digestion, is compensated for by vaso-motor contraction in the systemic area." Elsewhere, however,³ this observer says "the hypotonic effect of digestion on the arterial system (indicated by a fall in the brachio-radial pressure . . .) is much more common than the hypertonic effect"; whilst, according to Janeway,⁴ "the effect of the ingestion and digestion of food on arterial pressure is a disputed point

CONCLUSIONS.

The main difference between the arterio-sclerotic and the non arterio-sclerotic cases would seem to be that there is produced in the former, owing to an abnormal degree of arterial constriction, as the result of influences, which diminish this constriction and produce vascular relaxation, a more marked effect than usual, and, in consequence, either a greater fall of pressure, or a fall of pressure when in the non-arterio-sclerotic cases there would be a rise. This difference is evidenced more especially in the diurnal variations, but also to a less degree as the result of the ingestion of food

To give the conclusions in detail:—

(1) In cases of arterio-sclerosis, blood-pressure readings, taken in the evening, tend to be lower than the morning readings; in other words, the normal diurnal variation tends to be reversed.

¹ *Studies in Blood-pressure*, p. 236, 2nd edition.

² *Blood and Blood-pressure*, pp. 181-184.

³ *Studies in Blood-pressure*, p. 14, 2nd edition.

⁴ *The Clinical Study of Blood-pressure*, p. 117.

(2) In the majority of both the arterio-sclerotic and non-arterio-sclerotic cases, change of posture, from recumbency to sitting, causes a rise of arterial pressure affecting either the systolic or the diastolic pressure, or both. The change from the sitting to the standing position, on the other hand, corresponds in a majority of the cases of arterio-sclerosis to a fall of systolic pressure and a rise of diastolic pressure. The same tendency is noticeable in the non-arterio-sclerotic cases, although a sufficiently large number of these were not observed to enable any definite conclusion to be drawn as regards this point.

In the cases of arterio-sclerosis, whether associated with high or with low blood-pressure, the physiological alteration in arterial calibre, as the result of change of posture from recumbency to sitting, is in the majority of instances reversed.

The same tendency showed itself in the non-arterio-sclerotic cases. As regards change of posture from sitting to standing, a sufficiently large number of cases was not observed to enable any definite conclusion to be drawn.

The variations in arterial calibre, resulting from change of posture, are, in the arterio-sclerotic cases, on the average approximately normal in amount, and seem to be about equal to those in the non-arterio-sclerotic cases.

(3) As the result of ingestion of food, a fall of pressure affecting either the systolic, or both systolic and diastolic pressures, seems to be more frequent in the cases of arterio-sclerosis than in the non-arterio-sclerotic cases.

An equally common result in the arterio-sclerotic cases is an inverse variation of the systolic and diastolic pressures (the one increasing while the other diminishes, or *vice versâ*). This seems to be likewise a common phenomenon in the non-arterio-sclerotic cases.

METHOD OF INVESTIGATION.

The instrument, used for most of the blood-pressure determinations, was the latest form of the compressed air hæmomanometer of Oliver, which is an extremely convenient form of the Riva Rocci method, the armlet being adaptable to a tapering limb, and hence available for the forearm equally with the arm. A few observations (those on Nos.

	Morning.						After Dinner (5 to 15 minutes after).						Evening.		
	Recumbent.			Sitting up.			Standing up.			Recumbent.			Max.	Min.	Pulse Rate.
	Max.	Min.	Pulse Rate.	O.A.	Max.	Min.	Pulse Rate.	O.A.	Max.	Min.	Pulse Rate.	O.A.			
No. I. T. T., male, age 36 years. Atherosclerotic cases. Aneurysm of thoracic aorta. Radials and brachials thickened and tortuous, the former markedly so, and brachials irregularly thickened. Facials thickened.	Feb. 12, 1908. 11.30 a.m.	135 m.	100 m.	80	2.7 m.	118 m. ⁹ (below level of heart).	100 m.	87	1.9 m.	—	—	—	137 m.	95 m.	74
	Feb. 18, 11.30 a.m.	153 m.	96 m.	83	1.8 m.	153 m. ⁹ (below level of heart).	110 m.	83	2.3 m.	—	—	—	136 m. ⁹ (below level of heart).	110 m.	82
	Feb. 19, 11.30 a.m.	110 m.	90 m.	86	—	—	—	—	—	12.30 p.m.	113	93	—	—	—
	Feb. 25, 11.30 a.m.	120 m.	70 m.	71	2.9 m.	133 m. ⁹ (below level of heart).	90 m.	79	2 m.	—	12.45 p.m.	93	73	90 m.	68
No. II. C. G., male, age 51 years. Radials rather thickened and tortuous, facials slightly thickened, temporals normal.	Mar. 10, 11.35 a.m.	182 m.	120 m.	89	2.7 m.	—	—	—	—	—	12.40 p.m.	173	120	100 m.	89
	May 13, 11.35 a.m.	147 m.	120 m.	87	—	148 m.	130 m.	91	—	—	12.40 p.m.	160	120	120 m.	101
	Mar. 17, 11.45 a.m.	160 m.	100 m.	80	1.3 m.	172 m.	110 m.	82	1.5 m.	—	12.45 p.m.	165	80	100 m.	84
No. IV. H. L., male, age 68 years. Marked and irregular thickening, also tortuosity of left radial. (Right arm atrophied and in condition of atelectosis.) Dorsalis pedis on both sides, very markedly thickened and tortuous.													170 m.	100 m.	1.9 m.

See also record at 6.30 p.m.

No. V. M. B., female, age 50 years. Hemiplegia. Radials, brachials, facials, anterior and posterior tibials distinctly thickened but not tortuous.	Mar 25. 11.15 a.m.	228 m.	130 m.	77 m.	1'8 m.	228 m.	150 m.	89 m.	1'6 m.	—	—	—	—	12.45 p.m.	223 m.	130 m.	87 p.m.	6.15 p.m.	248 m.	140 m.	78 m.	1'8 m.
	Apr. 14. 11.45 a.m.	230 m.	130 m.	80 m.	2'6 m.	245 m.	150 m.	102 m.	3'1 m.	135 m.	82 m.	—	—	1.10 p.m.	230 m.	135 m.	74 p.m.	6.45 p.m.	223 m.	110 m.	79 m.	2'5 m.
No. VI. C. H., male, age 58 years. Chronic gout, old hemiplegia. Radials extremely tortuous and irregularly thickened, brachials markedly thickened and very tortuous, facials thickened, temporals not, anterior tibials unduly firm, not tortuous.	Mar., 31. 11.15 a.m.	190 m.	90 m.	57 m.	2'9 m.	177 m.	110 m.	65 m.	2'1 m.	—	—	—	—	12.30 p.m.	180 m.	100 m.	62 p.m.	6.30 p.m.	163 m.	90 m.	56 m.	2 m.
	Apr. 8. 11.30 a.m.	185 m.	100 m.	67 m.	2'0 m.	193 m.	90 m.	84 m.	3'2 m.	150 m.	90 m.	—	—	—	—	—	—	—	—	—	—	—
No. VII. H. D., male, age 45 years. Chronic interstitial nephritis. Radials and brachials markedly tortuous and thickened. Anterior tibials unduly firm and rigid.	Apr. 3. 11.15 a.m.	210 m.	115 m.	58 m.	2'5 m.	238 m.	150 m.	58 m.	2'1 m.	—	—	—	—	12.35 p.m.	202 m.	130 m.	64 p.m.	6.30 p.m.	196 m.	90 m.	57 m.	2'7 m.
	Apr. 7. 11.15 a.m.	140 m.	90 m.	107 m.	2'7 m.	130 m.	90 m.	108 m.	3'4 m.	150 m.	100 m.	114 m.	2'1 m.	12.40 p.m.	119 m.	75 m.	105 p.m.	6.20 p.m.	128 m.	80 m.	99 m.	3'1 m.
No. IX. C. H., male, age 43 years. Chronic interstitial nephritis. Radials and brachials distinctly thickened and rigid, not obviously tortuous, facials thickened. Posterior tibials feel unduly rigid.	April 10. 11.15 a.m.	168 m.	120 m.	94 m.	—	180 m.	120 m.	108 m.	—	170 m.	140 m.	120 m.	—	12.35 p.m.	145 m.	110 m.	104 p.m.	6.45 p.m.	162 m.	120 m.	90 m.	—
	April 28. 11.45 a.m.	203 m.	130 m.	80 m.	2'3 m.	213 m.	125 m.	83 m.	2'1 m.	—	—	—	—	12.40 p.m.	207 m.	120 m.	79 p.m.	6.40 p.m.	194 m.	115 m.	79 m.	2'3 m.
No. X. F. G., male, age 44 years. Chronic interstitial nephritis. Radials thickened, rather tortuous. Brachials markedly and irregularly thickened, very tortuous. Facials thickened. Dorsalis pedis on both sides firmer than normal, tortuous.	May 12. 11.45 a.m.	234 m.	130 m.	65 m.	2'8 m.	210 m.	120 m.	77 m.	2'8 m.	190 m.	150 m.	104 m.	—	12.45 p.m.	240 m.	120 m.	68 p.m.	6.20 p.m.	245 m.	140 m.	76 m.	2'4 m.

*The forearm was approximately 6 inches below level of heart. †It had been at the level of the heart, the readings would have been approximately 12 mm. lower.

	Morning.						After Dinner (5 to 15 minutes after).					
	Recumbent.			Sitting up.			Standing up.			Recumbent.		
	Max.	Min.	Pulse Rate.	Max.	Min.	Pulse Rate.	Max.	Min.	Pulse Rate.	Max.	Min.	Pulse Rate.
ARTERIO-SCLEROTIC CASES—cont.												
No. XI. J. P., male, aged 76 years. Left radial thickened and tortuous, right one thickened but not tortuous, brachials thickened and tortuous both sides, especially right. Right dorsalis pedis feels firmer than natural and tortuous, left normal. Left posterior tibial feels normal, right not felt.	145 m.	110 m.	75 m.	147 m.	115 m.	85 m.	1'4 m.	125 m.	90 p.m.	119 m.	90 m.	77 m.
May 5, 11.45 a.m.							1'4 m.	125 m.	90 p.m.	119 m.	90 m.	77 m.
No. XII. J. W., male, aged 63 years. Diabetes mellitus. Radials very hard, rather tortuous (especially the left one). Arteries of leg not palpable. (Right leg has been amputated at knee joint.)	217 m.	100 m.	83 m.	212 m.	95 m.	87 m.	2'6 m.	185 m.	110 m.	188 p.m.	90 m.	86 m.
May 26, 11.15 a.m.							2'6 m.	185 m.	110 m.	188 p.m.	90 m.	86 m.
CASES PRESENTING NO SIGNS OF ARTERIO-SCLEROSIS.												
No. I. G. H., male, age 31 years	102 m.	67 m.	67 m.	110 m.	70 m.	73 m.	1'6 m.	126 m.	80 m.	12.45 p.m.	85 m.	67 p.m.
April 24, 11.45 a.m.							1'6 m.	126 m.	80 m.	12.45 p.m.	85 m.	67 p.m.
No. II. C. L., male, age 16 years	115 m.	80 m.	75 m.	120 m.	70 m.	—	1'5 m.	100 m.	80 m.	12.45 p.m.	70 m.	81 p.m.
April 29, 11.30 a.m.							1'5 m.	100 m.	80 m.	12.45 p.m.	70 m.	81 p.m.
No. III. J. D., male, age 35 years	104 m.	70 m.	54 m.	106 m.	80 m.	60 m.	2'6 m.	113 m.	Could not read.	12.40 p.m.	112 m.	75 p.m.
May 6, 11.45 a.m.							2'6 m.	113 m.	Could not read.	12.40 p.m.	112 m.	75 p.m.
No. IV. A. U., male, age 46 years	137 m.	75 m.	65 m.	145 m.	100 m.	77 m.	1'9 m.	134 m.	95 m.	12.40 p.m.	130 m.	85 p.m.
May 8, 11.30 a.m.							1'9 m.	134 m.	95 m.	12.40 p.m.	130 m.	85 p.m.
No. V. G. H., male, age 22 years	88 m.	60 m.	86 m.	98 m.	80 m.	103 m.	2 m.	93 m.	80 m.	12.40 p.m.	105 m.	75 p.m.
May 19, 11.30 a.m.							2 m.	93 m.	80 m.	12.40 p.m.	105 m.	75 p.m.
No. VI. R. D. G., male, age 28 years	103 m.	65 m.	64 m.	105 m.	80 m.	74 m.	2'2 m.	103 m.	90 m.	12.35 p.m.	135 m.	65 p.m.
May 29, 11.25 a.m.							2'2 m.	103 m.	90 m.	12.35 p.m.	135 m.	65 p.m.

10 and 11 of the arterio-sclerotic cases and on No. 3 in the second series) were made with Stanton's instrument, in which the same method is adopted, Oliver's armlet being used with it. The observations were all made on the forearm.

The observations on the internal arterial calibre were made with Oliver's arteriometer, the radial being used.

In making both the blood-pressure and the arteriometric observations, care was taken that the part of the limb used was at the level of the heart, the disturbing effect of gravity thus being eliminated.

ABBREVIATIONS.

O.A. = reading of arterial calibre.

Max. = maximum or systolic pressure.

Min. = minimum or diastolic pressure.

The results are recorded in millimetres of mercury = m.

ANALYSIS OF RESULTS.

(I) DIURNAL VARIATIONS.

(i) *Arterio-Sclerotic Cases*.—Nos. 2, 3 (1st observation), 5 (2nd observation), 6, 7, 8, 9, 10 (1st observation), 11 and 12 all showed a fall of systolic pressure in the evening as compared with the morning. Of this group, in Nos. 3 (1st observation), 5 (2nd observation), 7, 8, 10 (1st observation), 11 and 12 there was also a diastolic fall; of these in Nos. 3 (1st observation), 8, and 11 the diastolic fall was approximately equal in amount to the systolic, in Nos. 5 (2nd observation), 7, and 10 (1st observation) the diastolic distinctly exceeded the systolic fall, and in No. 12 the systolic fall greatly exceeded the diastolic. In Nos. 6 and 9 the diastolic reading remained constant.

In No. 2 a fall of systolic pressure corresponded with a diastolic rise, in No. 1 a very slight systolic rise was associated with a diastolic fall, whilst in No. 3 (2nd observation) there was a very slight systolic rise, but the diastolic reading remained identical.

In No. 4 a rise of systolic pressure corresponded with a constant diastolic reading, and in No. 5 (1st observation) and No. 10 (2nd observation) a rise in systolic pressure corresponded with a rise in diastolic pressure.

Pulse rate.—In Nos. 2, 5 (2nd observation), 6, 7, 8, 9 and 10 (1st observation), the pulse rate showed a fall in the evening as

compared with the morning observation. In No. 1, the pulse rate also showed a fall. In No. 3 (1st observation) it showed no alteration, but in No. 3 (2nd observation) it rose, and a rise also occurred in Nos. 4, 5 (1st observation), 10 (2nd observation), 11, and 12.

(ii) *Non-Arterio-Sclerotic Cases*.—In Nos. 2, 3, 5, and 6, a rise of systolic pressure occurred in the evening as compared with the morning, and in all of these cases, except No. 2, in which the diastolic pressure remained constant, there was also a rise of diastolic pressure.

In No. 1 there was a fall of both systolic and diastolic pressures, and in No. 4 there was a fall of systolic pressure and a rise of diastolic. In all the cases of this series there was an evening rise of pulse rate.

The fact of the general lowering of the pressure readings in the evening, as compared with the morning, in the arterio-sclerotic cases, a condition which does not occur in the other series, may perhaps be accounted for by an unusual degree of relaxation of vascular tone in the evening as compared with the morning. On the other hand, another explanation has to be considered, viz., that the fall of pressure is due to diminished cardiac action, for the fact must not be overlooked that, in the majority of the arterio-sclerotic cases, in which there was an evening fall of pressure, there was also a diminution of pulse rate. However, from the fact that only in 3 of the cases, in which there was a fall of both systolic and of diastolic pressures, was the diastolic reading lowered to a greater degree than the systolic, and in these not exclusively, affords evidence in favour of the first view.¹

(2) CHANGE OF POSTURE.

a. From Recumbency to Sitting.

(i) *Arterio-Sclerotic Cases*.—In Nos. 2, 3, 5 (1st observation), and 11 there was a rise of diastolic pressure, whilst the systolic pressure in the first three cases remained constant, and in

¹ In reference to this Howell and Brush have stated: "A rise of blood-pressure occasioned by an increased heart-beat (section of both vagi) affects the diastolic pressure to a greater extent than the systolic pressure." Also that "a fall of blood-pressure occasioned by vascular dilatation (section of both splanchnics) affects the systolic and diastolic pressures equally." A Critical Note upon Clinical Methods of Measuring Blood-pressure. *Boston Medical and Surgical Journal*, 1901, Vol. CXIV., p. 146.

No. 11 showed an insignificant rise. In Nos. 4, 5 (2nd observation), and 7 there was a rise of both systolic and diastolic pressures. In No. 9 there was a rise of systolic pressure, whilst the diastolic remained constant, and in Nos. 6 (2nd observation), and 10 (1st observation), there was a rise of systolic and a fall of diastolic pressure.

In Nos. 1, 6 (1st observation), 8, 10 (2nd observation), and 12, there was a fall of systolic pressure, associated in Nos. 1, 10 (2nd observation), and 12 with a fall, in No. 6 with a rise, and in No. 8 with a constant reading of diastolic pressure.

(ii) *Non-Arterio-Sclerotic Cases*.—In No. 6 there was observed a rise of diastolic pressure, whilst the systolic remained constant, in No. 3 there was a rise of diastolic pressure, whilst the systolic rose very slightly, in Nos. 4 and 5, there was a rise of both systolic and diastolic pressures, whilst in Nos. 1 and 2 there was a rise of systolic pressure, the diastolic in No. 1 rising to a very slight extent and in No. 2 falling.

b. From Sitting to Standing.

(i) *Arterio-Sclerotic Cases*.—In Nos. 9, 10, 11, and 12 there was a fall of systolic pressure associated with a diastolic rise; in No. 6 the systolic pressure remained constant, but the diastolic rose; in No. 5 there was a fall of both systolic and diastolic pressures, and in No. 8 there was a rise of both.

(ii) *Non-Arterio-Sclerotic Cases*.—In No. 2 there was a fall of systolic pressure and a diastolic rise; in No. 6 a very slight fall of systolic pressure, and a diastolic rise; in No. 5 there was a fall in systolic pressure, whilst the diastolic remained constant; in No. 4 there was a fall in both systolic and diastolic pressures; in No. 1 a rise in both systolic and diastolic pressures; whilst in No. 3 there was a rise in systolic pressure, but no diastolic reading could be obtained.

(3) CHANGES IN THE ARTERIAL CALIBRE.

a. Change from Recumbency to Sitting Position.

(i) *Arterio-Sclerotic Cases*.—In Nos. 2, 5 (1st observation), 7, 8, 10 (1st observation), 11, and 12, the normal postural variation was reversed, in Nos. 4, 5 (2nd observation), and 6, the normal postural variation took place; in No. 1, no conclusion could be drawn from the observations, and finally,

in No. 10 (2nd observation) there was no alteration in size of the vessel.

(ii) *Non-Arterio-Sclerotic Cases*.—In Nos. 1, 4, and 5 there was reversal of the normal postural variation; in No. 3, the normal postural variation took place; in No. 2, no definite result could be obtained, and in No. 6 there was no change in calibre of the artery.

b. Change from Sitting to Standing Position.

(i) *Arterio-Sclerotic Cases*.—In Nos. 6 and 8 there was reversal of the normal postural variation; whilst in No. 11 no definite result could be obtained.

(ii) *Non-Arterio-Sclerotic Cases*.—In Nos. 3 and 4 there was reversal of the normal postural variation; in Nos. 5 and 6, the normal postural variation took place; in No. 1, no change in arterial calibre was observed; and in No. 2, no definite result could be obtained.

(4) INGESTION OF FOOD.

(i) *Arterio-Sclerotic Cases*.—In Nos. 3 (1st observation), 5 (1st observation), 8, 9, and 12, there was a fall of pressure, as the result of ingestion of food, and this fall affected either the systolic, or both the systolic and diastolic pressures. In No. 2 there was a systolic fall and a very slight diastolic rise.

In Nos. 1, 3 (2nd observation), and 5 (2nd observation), there was a rise of pressure showing itself in either the systolic, the diastolic, or in both.

Finally, in Nos. 4, 6, 7, 10, and 11, the systolic and diastolic pressures varied inversely (the one rising when the other fell, or *vice versa*).

(ii) *Non-Arterio-Sclerotic Cases*.—In No. 1 was observed a fall affecting both systolic and diastolic pressures. In Nos. 3, 5, and 6, there was a rise affecting either the systolic, or both the systolic and diastolic pressures.

Finally, in Nos. 2 and 4, the systolic and diastolic pressures varied inversely (the one rising when the other fell, or *vice versa*).

I have great pleasure in thanking the physicians of the Middlesex Hospital for permission to use these records of cases under their care.

THE RHEUMATIC INFECTION.¹

A CLINICAL STUDY.

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RHEUMATISM is a disease which is to-day interesting numerous investigators in fields both bacteriological and clinical, yet its essential pathology still evades certainty, and really successful treatment is a very long way behind. To those who have kept themselves fully informed of all that has been done and thought about rheumatism in recent years, one can hope to tell nothing new; scarcely can one hope to do more than emphasise the need for greater exactitude in clinical observations and conclusions. It is, after all, to the busy general practitioner that we must look for filling in the lacunæ in our clinical knowledge of this disease. He alone has the opportunity of watching the progress of the "rheumatic family," of studying the various deviations from type, of noting the insidious development of organic heart disease, points in which our knowledge may almost be called elementary. But no useful work can be done until our knowledge of present facts is as precise as possible. It is with this view that I want, among other things, to clear away some mists and misconceptions which still cling to and form part of the general train of ideas, which the term "rheumatism" arouses in our consciousness.

"The fundamental difficulty in discussing rheumatism consists in defining what we mean by it," to quote Sir Thomas Barlow. Formerly, of course, it was, as Tilbury Fox said of eczema, a veritable rubbish heap of diseases. Into this heap clinicians have delved most diligently, and have brought forth diseases, truly in some variety. The inclusion by earlier writers of gout, osteo-arthritis, and gonorrhœal arthritis vitiates all the older statistics; and even now we find it difficult to accurately separate off certain cases of rheumatoid arthritis and other infective joint conditions. In reference to the lax usage of the

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word, Sir William Church says that "rheumatism has now become a convenient term to embrace myalgic, neurotic, and arthritic pain dependent on very various causes, of whose nature we are often ignorant."

"Convenient" it may be from some points of view, but I cannot but feel that we have got into the habit of calling a host of affections "rheumatic" and then resting content: whereas, if we honestly attempted to define what we meant by rheumatism, we should see that the use of the word nowadays often enough merely cloaks our ignorance, and conceals the necessity for further research.

How then shall we define rheumatism—the rheumatic infection? Practically everyone to-day regards it as a bacterial disease, and therefore it can include all and only those morbid conditions, which arise as a result of such bacterial infection. It is clear, then, that it is to the bacteriologists we must look in the final event to supply us with the exact limitations of true rheumatism as a clinical entity. What is the help they give us so far? Interesting as this branch of the subject is, I must confine myself to this statement: that two main views are held at the present day, one, that rheumatism is a specific infectious disease, with, of course, a specific micro-organism, the other denies that the infection is due to a single or specific organism. On this latter view, it has been regarded as an attenuated pyæmia, a pathology which has now but few supporters; and others would regard the *soil* as the specific element, which means that a variety of organisms may, in specially predisposed persons, bring about the disease.

The view that it is a *specific* infection is that to which bacteriological and clinical research more and more converge. At present there are many pathologists who, while accepting the hypothesis of specificity, assert that the microbe has so far eluded discovery, but, in England, at least, the researches of Triboulet, Poynton and Paine, Beattie, and others have carried conviction to the minds of many that the *micrococcus rheumaticus*, which they describe, is the cause of rheumatism.

But though bacteriologists have not as yet reached finality in these researches, and whatever objection we may make to the claims of this or that organism as a cause of the disease, the view that rheumatism is a specific infection provides the

best working hypothesis, and one which there is scarcely a clinician to-day but adopts. But all hope need not centre in the pathologist; on the clinical side we are gradually and more accurately defining the symptoms which belong to this infection. One general point, which I wish to make is this, that the more closely atypical cases are studied, the more do we tend to the view that rheumatism is a clinical entity, with fairly constant phenomena, and that many of these atypical "rheumatisms" are of a different pathology.

I may now review the various points which, in varying combination, enable us to make a clinical diagnosis with an approach to accuracy.

I would summarise them as follows:—

1. The family history.
2. A particular physical and mental type.
3. The presence of one or more of the symptoms included in the "Rheumatic Series," the most important manifestations of which are arthritic phenomena, fascial inflammations (including fibrous nodules), cardiac lesions, chorea, and certain skin eruptions.
4. That the symptom-complex and general course of the disease should conform to a particular type, of which two may clearly be recognised, the rheumatism of childhood and the rheumatism of the adult.

The importance of family history will be generally admitted; often several members of a family are affected. It may be that the manifestations in the different members of the family are not the same; in one a multiple synovitis, in another chorea, and, in a third, valvular disease of the heart proves the point. But authorities differ as to the extent to which heredity plays a part. While Dr. Cheadle gives 70 per cent. of all cases, commenting on the potent influence of a double strain in the parents, and Osler gives 25 per cent., Sir Wm. Church thinks that family rheumatism wants more proof. My own experience fully confirms Dr. Cheadle's statement that, in the rheumatism of childhood, the frequency of the disease in near blood relations is most marked. In 39 cases of my own, in which the point was specially investigated, there was a family history in 18, or nearly 50 per cent. But here let me enter a plea for more caution in the acceptance of a history of rheumatism either in the past of the patient,

or in members of his family. There are many families in which one or other parent will admit being "rheumatic," but that is not enough. One must, in the first place, be satisfied that the rheumatism, in an adult, has been a genuine arthritic attack, and not merely a myalgia; and further, the possibility of gonorrhœal arthritis, and other infective joint conditions must always be remembered. We really cannot accept a history of past rheumatism on the statement of the patient or the parent, or on the latter's version of the doctor's diagnosis; or in some cases even on the doctor's statement, so long as there are some among us who apply the term to almost any arthritic condition. This necessitates our leaving the nature of many cases in doubt, but rather open-minded doubt, than fixity of opinion with a grave risk of error. I consider this easy acceptance of "rheumatic" histories to be largely responsible for false ideas as to the rheumatic nature of certain affections, notably iritis, erythema nodosum, and peliosis rheumatica.

Further, the age, at which the reputed attack of rheumatism occurred is often of some help. I am accustomed to teach that a primary manifestation of rheumatism, after the age of 30, is quite rare. When once there has been a primary attack, subsequent ones may occur almost up to any age; after 30, what purports to be primary rheumatism should be viewed with the greatest suspicion. Sir William Church, in 943 cases, found that 83 per cent. occurred under 30, and only 2·4 per cent. after 40.

In 203 personally observed cases,¹ of which I have notes, I have not had a single case of undoubted rheumatism in which the primary attack occurred after 30 years, my latest case was at 30.

As a fact, rheumatism is essentially a disease of childhood and early adult life. This leads us to consider the differences of type at the two periods of life, these types gradually merging the one into the other, as we pass from childhood through adolescence to maturity.

The great difference in type must be understood before we can pretend to a clinical knowledge of the disease. I have somewhere seen the statement, with which I fully agree, that the student's ideas about rheumatism will never be accurately

¹ A considerable proportion of my cases are drawn from out-patients' and children's departments.

in perspective until the ordinary text-books, following the excellent example in Allbutt's *System*, describe the disease in two chapters, as it occurs in childhood, and as it occurs in adults. As students we learn rheumatism from the cases we see in hospital, from which we gather the notion—at least I did—that it is an aggressively painful disease of the joints occurring mainly in adults. The more numerous, more insidious, more deadly manifestations in childhood, even if their nature is recognised, do not obtain admission to hospital to anything like the same extent that adult cases do, or to which their importance entitles them.

In broadly contrasting the two types, I cannot improve on the words which Dr. Cheadle employs, saying that “in the rheumatism of childhood arthritis is at a minimum; endocarditis, pericarditis, subcutaneous nodules, and chorea are at their maximum. As life advances, this rule is gradually reversed, the joint affection grows more prominent, regular, and characteristic, while the other phenomena decline, and tend to die out.”

Another great difference is that, in childhood, the various lesions of the rheumatic series may appear in any order, may extend over any length of time, and may be complete or incomplete. That is, the various manifestations may occur together or be separated by long or short intervals, so that it is truly said that “the history of a rheumatism may be the history of a whole childhood.” It is also an undoubted fact that the rheumatism may be limited to a single event, *e.g.*, an arthritis, an endocarditis, or a chorea.

When once the truth of these generalisations is fully realised, our attitude towards any symptom suggestive of rheumatism in a child, should become one of the greatest watchfulness and care. We may not always be certain of its nature, but we can at least watch for the earliest possible confirmation of our suspicions.

Can we be forewarned with regard to a liability to rheumatism, as, for instance, we so often can with regard to tuberculosis? Not infrequently, I think, we can. I have referred to the family tendency of rheumatism, which, if not so marked as in tuberculosis, should at any rate put us on our guard as to the possible development in the younger generation of the affected family.

I think the rheumatic child is of a certain mental and physical type. Mentally, he or she is liable to be the "nervous" child of the family; perhaps an expression of that emotional instability which finds its culmination in chorea, of so frequent occurrence and recurrence in childhood.

Is there a facial appearance, a bodily habit, or a particular complexion, which may be regarded as sufficiently peculiar to, or characteristic of, rheumatism as to be of diagnostic value? I have studied this question for some years and feel that, in the case of children, at any rate, one must say that such a type can be recognised. It is more than a little difficult to define, but I should say that generally it approximates to the type so well known as "pretty struma." In out-patient teaching, I can demonstrate it with fair constancy in rheumatic patients, and I have, on several occasions, made a diagnosis of rheumatism solely on the appearance of the patient. But I must admit that, in most cases, I can only get as far as saying, "This child is *either* rheumatic or strumous." In 18 cases in children, in which the point is specially recorded in my notes, the appearance was more or less characteristic in 15. There is not perfect unanimity of description of the type, but my own would agree practically with that given by Dr. Hutchison, when he says, "These children are usually past the second dentition, for young children rarely suffer from rheumatism. They are dark rather than fair; their hair is dark, the eyes are dark, and they have long dark eyelashes. At the same time, they have a peculiarly white skin and a very good complexion; they have a clear, bluish-white sclerotic, and they have often very well-formed massive teeth, and particularly large, square, central upper incisors. They also exhibit very constantly what is termed a neurotic temperament, that is to say, more than other children they are subject to minor nervous disorders."

The long lashes and the "clear, bright-coloured complexion," as described by Dr. Odery Symes, are especially constant, and I agree with him in saying that the hair is not infrequently reddish or auburn. Most of such subjects can fairly be described as of the "pretty" type, and my personal impression is that the majority of adult patients, suffering from rheumatic cardiac affections, possess a certain refinement and delicacy of feature. They belong to the better-

looking section of the community. Many rheumatic patients are anæmic, this often adds to the characteristic appearance.

The list of symptoms, which I included in the "Rheumatic Series," does not, of course, enumerate all the various manifestations of rheumatism. One symptom I have *not* included and wish to emphasise its omission. It is iritis. I dislike to use the word "never" in medicine, but I believe that iritis does not occur as a manifestation of rheumatism. I have never met with a case; I have never met with anyone who could tell me of a case of which the rheumatic nature was certain. Yet people still believe in it, accept it, and, in the history of a case, regard it as an additional proof of its rheumatic nature. To me the occurrence of iritis is a piece of evidence as conclusive as can be hoped for in case-history that the disease under investigation is not rheumatic.

As a complication of rheumatism, it is not now mentioned in most modern text-books of medicine, though I believe this view occurs with regularity in works on ophthalmology.

The point is of considerable clinical importance, because, in the vast majority of cases in which iritis is a symptom of a constitutional affection, the disease is generally gonorrhœa, syphilis, or gout—anything *but* rheumatism.

ARTHRITIC PHENOMENA.

We now know that rheumatism is not essentially a disease of the joints, any more than is gonorrhœa, for instance. Moreover, acute synovitis is not by any means peculiar to rheumatism, but occurs in the course of a large number of other infections. Scarlet fever and gonorrhœa are well-known instances, but the pneumococcal infection, typhoid, cerebrospinal meningitis, septicæmia, tonsillitis, and syphilis in the early stage, furnish instances, though, of course, less frequently. The importance of this fact is apparent when we study such affections as erythema nodosum and peliosis rheumatica. Here the principal evidence in favour of their rheumatic nature is the occurrence of arthritic phenomena. But the rheumatic synovitis is true to type in the vast majority of cases, especially outside childhood. So much is this the case that the necessity of doubting the nature of a joint attack, which deviates from the well-understood rheumatic type and its clinical course, can scarcely be over-emphasised. For instance, the synovitis of

rheumatism leaves the joints as they were before. For a time a little stiffness may occur, but fixative, proliferative changes and destruction of tissues are not features of the rheumatic joint, I do not wish to take up an unduly dogmatic position, by saying that unequivocal rheumatism never leaves a joint permanently damaged, but I have yet to see it happen. Authors are agreed as to the infrequency of such a result, but generally admit that such cases *may* occur. It is permitted to say that when the joint lesion results in such permanent changes, the gravest suspicion attaches to its rheumatic origin. Not to do so is to frequently overlook a gonorrhœa, especially in a woman. About certain cases, it is difficult to be absolutely certain, but, so far as my experience has served me, every case of this doubtful nature has had something in its symptoms, course, or reaction to treatment which, from the rheumatic point of view, has been atypical. For instance, the primary incidence after 30 ; the *primary* invasion of the small joints of the fingers (such cases are seldom rheumatic) ; or the failure to react promptly to salicylate treatment. So constant is such reaction in rheumatism that it is not surprising that there is a growing tendency among clinicians to regard the effect of salicylates as a diagnostic criterion. With this my own observations are entirely in accord, and I would say, therefore, "distrust your diagnosis of rheumatism, if the temperature does not rapidly fall after the exhibition of the drug in suitable doses."

There is one class of case which to me has always presented difficulties. Rheumatoid-arthritis, a term at present applied to a group of diseases rather than to a single disease, may, in certain cases, have an acute onset which is clinically indistinguishable from rheumatism. These so-called fibro-arthritic cases occur not infrequently at the age of liability to primary rheumatism. Mistakes necessarily arise, and will do so, until we are supplied by the bacteriologists or chemists with certain means of diagnosis. Cases, which present the anatomical features of rheumatoid-arthritis, occasionally appear to have started in a way indistinguishable from rheumatism. We may suppose (1) that the disease has been rheumatoid arthritis from the first, or (2) that an original rheumatism has predisposed the patient to rheumatoid changes, or (3) that it has become transformed into rheumatoid arthritis

This last view is stated in many text-books, and some support is derived from the not infrequent occurrence of heart lesions and fibrous nodules in such cases. But heart lesions are a result of widely different infective and toxic processes, and of this nature the fibro-arthritic cases certainly must be. It serves to show that we still want the most careful and continuous observation of them from every point of view—which observation the general practitioner has it almost solely in his power to make. For in hospital we may see them at the beginning, and perhaps miscall them rheumatic; or, if seen later in the fibro-arthritic stage, we usually lack that precise information which is necessary to form an opinion as to the nature of the earlier attacks.

In early rheumatism the arthritic phenomena are greatly modified. We rarely see in a child the extremely painful multiple synovitis, with heat, swelling and redness, pyrexia and sweating, which make up the clinical picture with which we are so familiar as the age of incidence increases. Often the synovitis is so slight that it escapes attention; at any rate *medical* attention. But, frequently, synovitis is absent, the susceptibility of the synovial membrane increasing with age. But, on the other hand, with a comparative freedom from acute synovitis, there is a special tendency to involvement of tendinous and fibrous structures; this liability *lessens* with age, until, in adult life, it is practically non-existent. And as this fibrous inflammation is generally sub-acute, and the symptoms to which it gives rise often very slight, a knowledge of it is most important. The commonest symptom is that which mothers delight to call "growing pains." Now, as Goodhart remarks, normal growth is not painful, and such pains should always be treated with due seriousness, and enquired for in suspected cases. At the same time, I feel that we probably err if we assume that every child, who admits to growing pains, is rheumatic. It has seemed to me that it is possible in some cases to decide, from the description of the pains, whether they are rheumatic or not. In genuine rheumatic pains, the attacks seem to be fairly definite, with intervals of perfect freedom, and the mother can frequently fix the duration and date of such attacks. I very commonly get this history in cases in which the occurrence of other

manifestations leaves no doubt as to the rheumatic nature.

Rheumatic Fibrositis may sometimes produce special symptoms as, for instance, a limping and tip-toe gait when it attacks the hamstring tendons, or a torticollis. The limp may be readily put down to other causes, and serious cardiac trouble thereby remain unrecognised. In this connection may be mentioned the occasional occurrence of abdominal pains in rheumatism. I have seen a few cases. Here, again, one wishes to avoid the inclusion of every obscure pain in a child as rheumatic, but such a symptom may be useful in arousing our suspicions as to an underlying rheumatic tendency.

The fibrous inflammation finds very special expression in the occurrence of "fibrous nodules." These nodules, into a description of which I will not enter, are practically confined to childhood as an expression of rheumatism; they then have, moreover, a very serious meaning, coinciding, as they almost invariably do, with a serious and often progressive involvement of the heart. Their not infrequent occurrence in cases of chorea is further proof of its rheumatic nature. These nodules should be systematically searched for in every case of suspected rheumatism or of chorea; it is not sufficient to make a perfunctory examination of, say, the wrists, but the superficial bony and tendinous areas throughout the body must be explored. To discover them greatly helps in prognosis. Briefly, one can say that the larger and more numerous the nodules, the graver the outlook; in fact, a numerous crop of large nodules, a phenomenon but rarely seen in individual practice, practically amounts to a death warrant, from the almost invariable accompaniment of a pancarditis.

In adults they occur but rarely in true rheumatism, and they certainly have not the same serious significance. I have only once seen them in an adult, and then I did not personally verify the rheumatic attack. In later life they are usually met with in cases of rheumatoid arthritis, especially, I have thought, in those cases of rheumatoid arthritis, in which the early joint attacks resemble rheumatism, and in which one finds, not infrequently, a well-marked cardiac lesion; such cases merit a closer study.

Chorea.—I have analysed the notes of 102 personally observed cases, and find that 56 presented evidence of heart

lesion, in most cases permanent, a proportion which sufficiently emphasises its gravity.

The vexed question is its relation to rheumatism. I find that, in my cases, it was associated with arthritic phenomena (*i.e.*, joint swelling and "growing pains") in 37 cases, and, if the heart lesions are accepted as evidence of rheumatism, in 67. I suppose no one will venture to assert that chorea is *never* a manifestation of the rheumatic infection. What is more difficult to decide is whether *every* case of chorea is rheumatic. Authorities differ in their opinion. Osler, who, in a series of 88 cases, gives 21 per cent. only as presenting even the slightest evidences of arthritic troubles, appears to hold the view that some cases are non-rheumatic, while other observers would regard it as invariably a rheumatic manifestation. Certainly, we have so far observed no clinical differences, *quâ* chorea, between the undoubtedly rheumatic chorea and that which is not demonstrably of this nature. But one must consider the possibility, which we claim for multiple synovitis, that chorea may not be of constant pathology, but a symptom common to a number of diseases of a toxic or infective nature. This possibility is supported by the occurrence of chorea in pregnancy, and occasionally in the course of such infections as pyæmia and septicæmia. The chorea following distemper in dogs also lends much support to this view. Senile chorea is another variety which seems to point to the possibility of more than one cause. The occurrence of a cardiac lesion in chorea only emphasises its toxic, and not necessarily its rheumatic nature.

I should like to draw attention to those cases of chorea alleged to follow fright, which I do not believe to be an adequate cause. In my cases, previously referred to, and in the very much larger number of which I have not preserved records, I have never been able to satisfy myself that I have seen a genuine case of "fright" chorea. In the lay mind this sequence of events is almost ineradicably fixed, yet of what child cannot a sudden fright or grief be alleged, in all good faith, if its doings are thought over with a sufficiently imaginative retrospection? But one meets with not a few cases of severe habit spasm or convulsive tic, with a superficial resemblance to choreic movements. These, truly, may be due

to a sudden shock or emotion. Again, the imitative chorea, rare though it is, cannot be regarded as true chorea.

But despite the lack of absolute proof, and in view of the fact that the rheumatic lesions in childhood may occur in any order and as isolated phenomena, I always advise the adoption of the hypothesis—but only as a hypothesis—that *all* chorea is rheumatic. It has this very great practical advantage, that it sharply defines the necessary lines of treatment. If it is admitted, as I think it must be, that we cannot always distinguish rheumatic chorea from supposed non-rheumatic chorea, and if it is conceded, as indeed it must be, that any manifestation of rheumatism in childhood carries with it the gravest risk of permanent damage to the heart, surely our only duty to our patients is to treat every case of chorea as if it *might* be rheumatic.

I should like to digress here for a moment in order to consider in what respect the treatment of chorea becomes, from this point of view, invariable and sharply defined. It means this, that every case of chorea should be sent *at once* to bed, kept absolutely at rest while there, and kept there for as long as may be necessary. And the necessity will be estimated by the lessening in the movements and the emotional disturbances, and even more especially by the condition of the heart. This requires the earliest and most exact observations as to its condition, and, moreover, that these observations shall be frequently repeated. Thereafter, throughout childhood and adolescence, the patient must be regarded as a “rheumatic” suspect.

If the heart presents no evidence of lesion, and the movements cease, and there is no further manifestation of rheumatism, bed may be exchanged for the couch, always proceeding cautiously. Beyond this, I wonder whether any drug shortens the course of chorea. Is not bed after all the sole specific? I have tried most treatments, but remain for the most part unconvinced of the real value of any of them. I think, however, the salicylate treatment deserves a more extended trial.

THE HEART LESIONS.

I suppose few diseases more strikingly reproach our powerlessness and failure to advance than rheumatic heart-troubles; with regard to their prevention we stand almost where we

ever did, and these hearts are for the most part damaged in childhood, often quite early. The later the rheumatic incidence, the less frequently, and, one may say, less severely, is the heart attacked. In 150 cases of heart disease of a definitely rheumatic or choreic nature, I find the age at which the heart became affected to be as follows:—

Under 10	-	-	50 = 33 per cent.
10 to 15	-	-	58 = 39 „
15 to 20	-	-	21 = 14 „
20 to 30	-	-	15 = 10 „
30 to 40	-	-	1
Uncertain	-	-	5
			<hr/>
			150

In many cases the age at which the heart trouble commenced was probably earlier than my figures show.

Nothing can plead more eloquently than such facts and figures for every effort to understand, diagnose, and cope with the devastating effects of early rheumatism. Everyone is familiar with the valvular and pericardial lesions, which occur so frequently, and with these I shall not specially deal. Neither need I remind you how difficult or impossible it oftentimes is to determine whether the heart is affected or no. Sometimes, indeed, the cardiac inflammation gives absolutely no sign of its presence, and only later do we realise the insidious development of a sclerosing lesion. The lesion is most frequently an endocarditis, usually revealed by a systolic mitral murmur. If the presystolic murmur occurs, it may be taken as evidence of a relatively ancient lesion, though the liability of a damaged heart to recurrent endocarditis always necessitates the same watchfulness. Pericarditis, alone or with other lesions, is frequently a painless affection, and one cannot help being struck by the frequency with which its existence is revealed only on routine examination. But it is to the lesions of the myocardium that attention is now especially directed. It is now known that there is very frequently an early involvement of the cardiac muscle, with actual cellular exudation; in these foci the *micrococcus rheumaticus* has been demonstrated. This cellular exudation is capable of resorption, possibly complete, but it may go on to the formation of sclerotic areas in the myocardium. Mackenzie and others

have noted in rheumatism, as in other infective processes, a depression of conductivity of the auriculo-ventricular bundle. A short time ago, I observed a typical case of the Stokes-Adams syndrome, in a man of 38 : the only discoverable cause was an attack of rheumatic fever in earlier life. Within a few days of the bradycardia, he developed an ordinary attack of rheumatic fever. Again, rheumatism, as other febrile intoxications, may produce acute changes in the cardiac muscle, leading to weakness of action and dilatation of the chambers.

These are the known pathological facts, and how are they correlated with the signs observed at the bedside ? There is little doubt but that we must be content with much less than the presence of a definite murmur, if we are to accurately infer involvement of the heart at an early stage. A slight alteration in quality of the cardiac sounds, an early accentuation of the second sound in the pulmonary area are among the earliest signs. Irregularity of the heart's action and slight dilatation are not at all infrequent, and may indicate an endo- or myo-carditis. These latter signs may pass away, soon and completely, but I have observed a number of cases in children, in which simple irregularity persisted for some time after the attack, and without the presence of any murmur.

What is the practical bearing of these facts ? Obviously we cannot always be sure of the existence, nature, or extent of a cardiac lesion, but of this we *are* sure, that, in a child, the liability to heart lesions is extreme and grave. It would seem, therefore, that all early rheumatism should be treated in bed, in the first place, and only allowed to depart therefrom when repeated examination of the heart has proved satisfactory. If then we overlook cardiac trouble we cannot help it, we shall at least have done our best. And if there is the *slightest* departure from the normal in the quality of the sounds, the size of the organ, or the regularity of its action, the absolute rest in bed should be prolonged for an indefinite period. It is a comparatively simple thing to keep a child in bed ; with the breadwinner of the family, there might be some excuse for taking risks : in the case of children none. I quite admit that this is a counsel of perfection, and we can by no means get parents to see eye to eye with us in the matter. This we cannot help ; when we ourselves once clearly realise the necessities of the cases, and honestly attempt to apply the

rational treatment, we may wash our hands of further responsibility.

My impression is that myocardial changes are common, and, with rest and patience, may be recovered from : pathological research points to the probability of resorption of a moderate cellular exudate. But beyond rest, I think we might well attempt something of a more directly remedial nature. In this way I think that the treatment suggested by Caton, the application of blisters and the administration of sodium iodide, in addition to the absolute rest, might be given a much more extended and systematic trial. It is at least reasonable, and his own cases would seem to justify the measures adopted. The prevention, recognition, and remedial treatment of rheumatic heart disease is one of the crying needs of modern medicine.

SKIN LESIONS.

These are included in my last term of the Rheumatic Series, and are generally held to include miliaria, erythema multiforme, erythema nodosum, peliosis rheumatica, and perhaps psoriasis.

The appearance of the miliaria is beyond discussion. Among the very large number of cases of psoriasis, which a skin department brings before me, I have only noted a definite rheumatic taint in a few instances, certainly not more than may be explained more easily by coincidence than by the assumption of a relationship between the two diseases.

The most interesting of the eruptions is erythema nodosum. Into a description of this affection I do not propose to enter, but I should like to state my creed with regard to it. I believe it to be a separate infectious disorder with well-marked symptoms, fairly constant in type and course. It should be described in the text-books of medicine as in the case of exanthemata, such as measles and chicken-pox ; no more than these diseases does it belong to the domain of dermatology.

The points upon which upholders of its rheumatic nature rely are as follows :—

- (1) The frequent incidence with or shortly after a tonsillitis.
- (2) The very frequent presence of pains in the limbs or definite joint pains.
- (3) The not infrequent presence of effusion into one or

more joints.

(4) The presence of certain cardiac phenomena.

(5) Its occurrence in patients, who give a personal or family history of rheumatism, or who exhibit a lesion, *e.g.*, organic heart disease, which makes the presence of a rheumatic taint at least very possible.

All these points of course I freely admit ; but I deny that, with one exception, taken together or separately, they afford the least *proof* of the rheumatic nature of the disease. The exception refers to the last point. If the frequent occurrence of a personal or family history of genuine rheumatism can be shown to exist, we have some evidence of the association, but then not necessarily of identity.

Tonsillitis is such a frequent precursor or accompaniment of infections that it is not of the slightest diagnostic value in regard to the rheumatic nature of anything. There is no particular variety of tonsillitis which characterises rheumatism ; moreover, its frequency in this disease is extremely variable.

What I have said as to the frequency of synovitis in a large number of infective processes precludes this symptom being of value as evidence ; moreover, the synovitis of erythema nodosum differs in many respects from that occurring in rheumatism.

In most cases of erythema nodosum the heart is normal throughout, but, occasionally, there are noted one or more of the following cardiac signs : increased rapidity, slight dilatation, occasional irregularity, some alteration of the quality of the sounds, or there may be a definite, though usually slight systolic murmur at apex or left base.

But if one follows the cases through, and this is the point I would emphasise, in almost every case these signs clear up, and the heart remains perfectly sound. This has been my invariable experience, and that of others who record *personally observed* cases. As to the explanation of the signs (for I must admit that we rely on no more for the diagnosis or commencing rheumatic endo- or myo-carditis), I think that they are the result of either a toxic weakening of the cardiac musculature, or, likely enough, of an actual myo-carditis. One must admit that permanent organic disease *may* result, though I have never seen it, and clinicians are practically unanimous

as to its extreme rarity. All this is what I may call internal evidence—sore throat, synovitis, exanthem, cardiac lesions—does it not remind one of the syndrome met with often enough in scarlet fever? In the light of our present knowledge we must require evidence of its more than occasional association with family rheumatism, or manifestations of rheumatism in the individual at times other than that of the exanthem itself.

The chief supporter of the rheumatic view in this country of recent years has been Sir Stephen Mackenzie; there have not been wanting a number of clinicians, among them Trousseau, who have held strongly the contrary opinion. Against its identity with rheumatism the evidence is of two kinds: that afforded by undoubted cases of rheumatism, and that from the cases of erythema nodosum.

It must be one of the rarest experiences to see an undoubted attack of erythema nodosum during the course of genuine rheumatism. Many examples are recorded, but, in nearly all, the alleged antecedent rheumatism comes within the prodromal period of erythema nodosum, which may be as long as twenty-five days, and during the whole of which there may be arthritic phenomena.

Care must also be taken not to confuse the eruption with certain kinds of rheumatic exudative erythema. It would seem almost incomprehensible that, if the synovitis of erythema nodosum were really rheumatic, rheumatic fever should not be more often accompanied by an eruption of erythema nodosum. For some time past I have systematically interrogated undoubted rheumatic subjects as to a past history of erythema nodosum, a type of eruption which, in all but the mildest cases, the memory could probably recall. So far I have met with no case of the association. In thirty-four cases under my personal observation, I can at most admit a possible rheumatic connection in four, and a very improbable one in four. In a further series of thirty-four cases, which I have collected from the records of the Leeds General Infirmary, two show a possible and two an improbable relationship to rheumatism. This latter series is the more interesting, because, in almost every case, the family and personal histories have been minutely investigated, generally on the assumption that the disease is a rheumatic manifestation. Indeed it was not

infrequently labelled as acute rheumatism.

In peliosis rheumatica, originally described by Schönlein, we again have a disease, probably a specific bacterial infection, which has no connection whatever with rheumatism. As to its place in the series of primary purpuras, *i.e.*, purpura simplex, purpura rheumatica, purpura hæmorrhagica, and Henoch's purpura, I will not enter. But in this group, Schönlein's originally strictly described disease has become accepted as a rheumatic manifestation owing to the loose employment of a mere word. Here again, in the primary purpuras, we have an infective process, or a series of different infective processes, accompanied with some frequency by joint lesions. But there the resemblance ceases. The differences are too numerous to detail; absence of sweating and of a tendency to endocardial complications are among the more striking; it will, in my opinion, suffice for anyone to study the two affections with an open mind to come irresistibly to the conclusion that they are separate diseases. We get purpuric eruptions in the course of rheumatism, it is true, but rarely, and only in those severe cases in which there are grave complications (usually heart lesions)—cases which are not infrequently fatal. And in these the disease picture is absolutely different from Schönlein's original description, a thing nowadays but little known and less heeded. As Litten¹ says, "French and English authors particularly offend in classifying cases of the hæmorrhagic diathesis with joint lesions as 'acute articular rheumatism with atypical course,' thus constructing a new disease picture." It is in these severely toxic cases of rheumatism, also, that the exudative erythemata usually occur; especially in children and adolescents. As an isolated phenomenon, I doubt if erythema exudativum has more than a very occasional relation to rheumatism.

In conclusion, I think that what I have said leads to this: that rheumatism is so serious a disease that we must treat it always with the utmost care, particularly in the matter of prolonged rest. From this it follows that, while, on the one hand, we cannot risk overlooking any really rheumatic manifestation, on the other, we are naturally anxious to put outside that category any affection which can be proved to be of a different nature.

¹ *Nothnagel's Encyclopædia (American Trans.)*, Vol. "Hæmorrhagic Diathesis," p. 763.

LABYRINTHINE NYSTAGMUS AND LABYRINTHINE DISEASE.

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WITH the physiological connection between the semicircular canals and the muscles of the eye, we have been acquainted for many years, indeed, even before Ewald performed his classical experiments on the semicircular canals of pigeons. It will be remembered how Ewald found, on stimulating the intra-canalicular nerve-endings by setting the endolymph in motion, that he was able to induce nystagmoid movements in the eyes, and that this nystagmus varied in character according to the canal selected for stimulation, and in direction according to the direction of the current of endolymph in the canal. Thus, when the horizontal semicircular canal was stimulated, the nystagmus was horizontal, and when the vertical canals were stimulated, the nystagmus was vertical or rotatory ; while, with regard to the direction of the nystagmus, the experimenter showed that, when the endolymph was propelled towards the ampulla of the horizontal canal of one side, the nystagmus was directed towards the same side, and, when the current was reversed so that the endolymph flowed from the ampulla towards the convexity of the canal, then nystagmus was directed towards the opposite side. Quite recently Hautant has confirmed Ewald's results in a case of fistula of the external semicircular canal in the human subject.¹

Labyrinthine nystagmus distinctly differs in appearance from the nystagmus we are familiar with in insular sclerosis and certain ocular disorders, in which the oscillations are regular, the to-and-fro excursions being equal in rhythm. In the nystagmus which follows stimulation of the vestibular nerve, on the other hand, the oscillations are unequal, one excursion being slow and the other quick. Vestibular nystagmus is thus made up of two phases, (1) a slow deviation of the eyeball from its position ("the long phase"), followed by (2) a short twitch of the eyeball back to its original position ("the short phase"). The nystagmus is said to be *directed* towards the direction of the short movement. When, for

example, during the slow phase, the eye deviates towards the left, and is caught back again towards the right during the short phase, we say that the nystagmus is "directed towards the right." It is a feature of labyrinthine nystagmus that its oscillations are exaggerated when the eyes are turned in the direction of the short movement, and diminished or abolished when the eyes are turned in the direction of the slow movement.

Rotation Nystagmus.—We have all experienced the vertigo that follows rotation of the body round its vertical axis. This vertigo is due to stimulation of the end-organ of the vestibular nerves in the semicircular canals consequent upon the turning movement. If, after rotating the body, the eyes are examined they will be seen to manifest typical labyrinthine nystagmus. Further, this nystagmus varies in character and direction in agreement with the direction of the rotation and the position of the head during rotation, the normal being as follows:—

After rotation from left to right (that is, in the direction of the hands of a watch, or, as in the military command, "right about turn,") with the head erect, the nystagmus is horizontal, and is directed to the left. And after rotation from right to left, the nystagmus is directed to the right.

Expressed as a law, we may say that the nystagmus, after rotation in the erect position, is directed to the side from which the patient was rotated. It is supposed that the nystagmus from rotation is caused in the same way as in Ewald's experiments, that is to say, by the movement of the endolymph of the semicircular canals to and from their ampullæ.

Method of Examination.—The patient is seated on a revolving stool with his feet off the ground. The eyes are protected by smoked glasses in order to prevent the patient from fixing the surrounding objects, and so inhibiting the nystagmoid movements. Bárány,² whose work on this subject has placed all otologists in his debt, states that, in rotating the patient, the best results are obtained by revolving him ten times in 20 seconds. Then the rotation is abruptly stopped, and the eyes watched as long as the nystagmus continues, its duration being measured by means of a stop-watch.

In normal circumstances, the nystagmus continues for about 40 seconds, but considerable variation in the duration may be

expected even in healthy people. Generally speaking, an unusual prolongation of this period is of less significance with regard to the condition of the labyrinth than a decided shortening, particularly if the reduction is more marked after rotation to one side than after rotation to the other.

Caloric Nystagmus.—Labyrinthine nystagmus can also be induced by syringing cold or warm water into the external auditory meatus. Probably every practitioner, who has syringed out the external meatus in order to dislodge cerumen, knows by experience that vertigo occasionally follows this procedure. The vertigo is sometimes ascribed to the fluid impinging forcibly upon the membrana tympani and ossicles, and so disturbing the intra-labyrinthine pressure, but it is not likely to occur if the water used is of the body temperature.

As a diagnostic measure, the caloric test of labyrinthine activity promises to be of great value, of greater value, perhaps, than the rotation methods, seeing that the caloric tests are more easily carried out, and that by them only one labyrinth is interrogated at a time. It is said that rotation chiefly stimulates the labyrinth of the side towards which the patient is turned, and, while this may be quite true, nevertheless there can be no doubt but that, in rotation, the labyrinth, from which the patient is turned, must also be roused into activity, consequently, we cannot implicitly rely upon the rotation tests in cases in which one labyrinth is diseased and the other active, particularly if the disease in the affected labyrinth has not entirely destroyed its activity. When both labyrinths are equally affected, or when the function of one labyrinth is completely abrogated, the test by rotation is quite trustworthy.

Method of applying the Caloric Tests.—Water of a temperature, either above or below that of the body, is gently run into the external auditory meatus from a douche-can, while the patient is made to look in an upward direction, or else to one or other side. (The test can be carried out with the patient in bed.) I have found that, as a rule, the nystagmus is most quickly observed when the eyes are looking upward, but it is advisable to cause the patient to turn them, from time to time, in the direction towards which we expect the nystagmus to be directed. The earliest sign of the onset of the phenomenon is a slight wandering of the eyes, just as

if the patient had got tired looking so long in one direction. This is, in reality, the beginning of the slow phase, but the complete nystagmoid cycle does not become fully developed until a few seconds later. The moment the fully formed nystagmus is observed the douche should be stopped, and the period of time that has elapsed from the start of the test noted. In order to obtain uniform and accurate results, by which alone the time-measurement can be made a guide to the degree or functional activity of the vestibular system, the water should always be of the same temperature, and the douche-can should always be held at the same level above the ear. I usually employ a temperature of between 22° and 24° C., but, in cases in which the reaction is slow in appearing, the temperature of the water may be lowered in order to sharpen the stimulation.

The effect of cold in one external meatus is to produce nystagmus towards the opposite side, and the effect of warmth is to produce nystagmus to the same side. Vertigo accompanies the nystagmus just as in the rotation test, but the vertigo is not complained of, as a rule, until after the nystagmus is fully developed, and both nystagmus and vertigo become most marked after the syringing is stopped. According to my own investigations, using water of a temperature from 22° to 24° C., nystagmus normally appears in from 20 to 50 seconds, the average being 32.6 seconds. The ocular movements continue for a much longer period after the cessation of the syringing than after rotation, doubtless because the bony walls of the meatus and labyrinth retain the cold, or heat, as the case may be, for some considerable time. Consequently, when both ears are to be tested, care must be taken that the nystagmus from one side has passed off before the other side is tested. The speediest method of attaining to this end is to syringe the meatus of the ear, that has just been tested, for a few seconds with warm water, if cold has been used, or with cold water, if warm has been used.

NYSTAGMUS AS A SYMPTOM AND SIGN OF LABYRINTHINE DISEASE.

Spontaneous Nystagmus.—Bárány has found that 60 per cent. of healthy people exhibit slight nystagmus on extreme lateral deviation of the eyes, a fact that must be remembered

when we are examining patients suspected to be suffering from labyrinthine disorders, of which spontaneous nystagmus is a frequent, if not a prominent, sign. The following considerations will aid us in distinguishing the spontaneous nystagmus, so frequently found in health, from that due to labyrinthine disease. Pathological nystagmus is generally well developed, while the other is, as a rule, imperfect. In unilateral lesions of the vestibular tract, the nystagmus is most obvious when the eyes are turned to one or other side, while the nystagmus met with in healthy people is present on looking to either side.

Any lesion of the vestibular tract, from its end-organ in the semicircular canals to its nerve-centres in the medulla, that interferes with its functional activity may cause nystagmus, but, for the purposes of this paper, we propose to deal only with lesions of the labyrinth.

The spontaneous nystagmus or severe labyrinthine lesions, like the vertigo which is so prominent a symptom of these cases, is constant, and can always be seen when looked for ; in minor lesions and in the incipient stages of severe lesions, on the other hand, the vertigo and nystagmus are intermittent, coming and going together, sometimes in response to external stimuli, such as sudden movements of the head, etc., sometimes independently of such stimuli. Continuous vertigo and nystagmus, being symptoms of severe lesions, as has been said, are present in purulent disease when an extensive area of the labyrinth is involved. Continuous vertigo and nystagmus, also are occasional symptoms of cerebellar abscess. But Neumann has pointed out that, in cases in which the concomitant symptoms of cerebellar abscess do not clear up the diagnosis, it is still possible to differentiate between the two diseases by means of the nystagmus, for, in labyrinthine disease, the nystagmus is directed to the sound side, and in cerebellar disease it is directed to the same side as the disease.

Induced Nystagmus in Labyrinthine Disease.—The value of the labyrinthine tests, described in the earlier portion of this paper, is particularly manifest in cases of suppuration of the middle ear. It is only within recent years that we have begun to realise the frequency with which suppuration of the antro-tympanic structures extends to the internal ear. Modern

pathology has taught us, however, that not only is this extension by no means rare, but that the labyrinth is one of the commonest routes, if not the commonest, by which infection spreads to the meninges, where it sets up the most fatal of all the intra-cranial complications of aural suppuration, meningitis. Further, the work of surgeons, both in our own country and abroad, has proved that we can tackle the complication of purulent labyrinthitis with striking success, provided that a timeous diagnosis is made. It is in the diagnosis of this disease that the nystagmus tests have proved of greatest utility.

There are several distinct clinical types of purulent, or, as it would be better to call the disease, *infective* labyrinthitis, the symptom-groups of which, as may be seen in the following descriptions, differ very considerably.

(1) *Acute Infective Labyrinthitis*, more or less extensive, and marked by total destruction of the vestibular end-organ.

This disease is caused most frequently by extension of the infective process from the middle-ear in cases of suppuration of that cavity from scarlet-fever or influenza, but it may also follow upon the ordinary chronic suppuration of the middle ear. The evolution of the disease may be described as occupying three stages, in any of which death may occur if the labyrinth is not operated upon. These stages are (*a*) the stage of onset; (*b*) the stage of latency; and (*c*) the stage of intra-cranial infection. The resemblance, which the course of the disease bears to cerebral abscess in respect of its stages, is worthy of note.

(A) *The Stage of Onset*.—The symptoms, which mark the spread of infection to the labyrinth from the middle-ear, are so characteristic in acute infective labyrinthitis that diagnosis is readily and easily made. Agonising pain in the ear with violent headache and pyrexia suddenly appear, or, if they have already been present when the disease was confined to the middle ear, undergo marked exacerbation. There is continuous vertigo, so violent that the patient is unable to maintain himself in the upright position. Spontaneous nystagmus accompanies the vertigo, and is directed to the side opposite to the disease. Almost invariably, the patient will be found to prefer lying on the sound side, because he soon makes the discovery that, in this position, the dis-

troubling subjective movement of external objects is least troublesome.

The deafness also undergoes a change when infection invades the internal ear. During the period when the disease is confined to the middle ear, the deafness is obstructive in type, but when the internal ear is attacked it becomes perceptive, and at the same time much more severe.

If now we have recourse to the nystagmus tests, we shall find that the normal reactions have quite disappeared. Rotation cannot, of course, be carried out on a patient in the early stage of acute infective labyrinthitis, but the caloric tests can be performed without causing him any discomfort. In these cases, it is advisable to use warm, and not cold, water for syringing, because, as we know, when cold is used, the nystagmus is directed towards the opposite side when the labyrinth is active, and, in the disease we are now considering, there is already present spontaneous nystagmus towards that side, consequently if we used the cold test it would be difficult, if not impossible, to decide how much of the nystagmus was spontaneous, and how much, if any, was due to the test. With warm water, on the other hand, if the labyrinth is healthy, the nystagmus will be directed to the same side, and so, if we syringe warm water into the meatus, and there is no appearance of nystagmus to the same side, and no interference with the spontaneous nystagmus to the opposite side, we may safely conclude that that labyrinth is out of action.

The writer ventures to go a step further in discussing the utility of the caloric test in differential diagnosis. It is possible to imagine a case in which there is nystagmus to one side, and in which it is difficult to decide whether the symptom is due to a labyrinthine lesion of one side or a cerebellar abscess of the other. To take a concrete instance, spontaneous vestibular nystagmus to the left might arise either from a right-sided labyrinthine, or a left-sided cerebellar, lesion, and the concomitant symptoms might be of no assistance in guiding us to the correct conclusion. In those circumstances, the caloric test would be of great value, for, if the cause was destruction of the right labyrinth, the warm caloric test applied to the right ear would be negative, whereas, if the cause of the nystagmus was a cerebellar lesion of the left side, the caloric

test in the right ear would be positive, either causing nystagmus to the right side, or interfering with the spontaneous nystagmus to the left side.

(B) *Stage of Latency*.—After the first few days of acute infective labyrinthitis, if the patient survives, the symptoms become less pronounced, and the disease passes into a latent condition, similar to what happens in many cases of cerebral abscess, and the same wise and caustic remark, applied to the latent stage of cerebral abscess, also applies to this stage of acute infection of the labyrinth, that “the latency exists more in the mind of the observer than in the state of the patient.” The vertigo disappears, the nystagmus becomes less apparent, and, although the perceptive deafness persists, the patient, thinking he is well, may get up and go about his work. In this stage, in which the patient’s life is only respited, the diagnosis depends upon, (a) the history of a severe illness with the symptoms just described; (b) the perceptive deafness indicative of the destruction of the cochlear branch of the auditory nerve, etc.; (c) the negative responses to the labyrinthine tests on the affected side, indicative of the destruction of the vestibular branch of the same nerve.

(C) *The Stage of Intra-cranial Infection*.—The most usual intra-cranial sequel of infective labyrinthitis is, as we have seen, meningitis, but cerebellar abscess occasionally forms.³ In either case, in this stage, the signs of labyrinthine disease may be masked by those of the terminal lesion.

Both in the acute and in the latent stage, operation on the labyrinth is imperatively called for, and should not be postponed, for the patient is in imminent peril. In the latent stage, the temporary mildness of the symptoms may tempt the operator to content himself with performing the radical mastoid operation only, but he must not blind himself to the fact that these are cases in which incomplete operation merely precipitates disaster. In the third stage, the surgeon must be prepared to operate both on the labyrinth and on the brain.

(2) In the second variety of septic labyrinthitis, which may be called *Circumscribed Infective Labyrinthitis*, the infective process is less virulent than in the former variety, the resulting lesion is localised to a comparatively small region of the internal ear, the course of the disease is more chronic, and the danger

to life, though not negligible, is less immediate. The usual lesion consists in a circumscribed caries of the outer wall of the labyrinth, frequently resulting in the formation of a fistulous opening in that wall, and this fistula is most usually to be found on the elevation formed by the external semicircular canal on the inner wall of the *aditus ad antrum*, where it is easily seen and should always be looked for, when the aditus is opened up in the course of the radical mastoid operation.

The most constant feature in the symptomatology of circumscribed infective labyrinthitis, that of transient attacks of vertigo, is, of itself, of very little diagnostic importance, since such attacks are common, not only in middle-ear suppuration, when there is no affection of the labyrinth, but also in many diseases which have no connection whatever with the ear. Thus, to make a history of transient attacks of vertigo the sole reason for opening up the labyrinth would be unjustifiable. But the importance of vertiginous attacks, occurring in the course of middle-ear suppuration, lies in this, that they may be due to labyrinthine involvement, and should, therefore, lead to a systematic investigation of the labyrinthine functions, cochlear and vestibular, by means of the usual tests. With regard to the vertigo itself, we have the high authority of Bárány for the statement that if, between the attacks, vertigo can be brought on simply by altering the position of the patient's head, bending it back, for example, then there is a strong probability that the vertigo is labyrinthine. In addition to carrying out this simple test, we should investigate the patient's balancing powers. If the patient, without losing his balance, can hop backwards on one foot with the eyes closed, then the labyrinth, it is said, can be excluded. My own experience leads me to add to this statement the words "unless in destruction of the labyrinth of long standing," for in a case under my care, in which this difficult feat can be successfully performed, the history of the case and the complete absence of all response to the labyrinthine tests on one side, show that the vestibular sense is no longer active.

In circumscribed infective labyrinthitis, there may be present a delayed response to the caloric tests showing an impairment of the vestibular sense. If masses of granulations fill up the external meatus, a delayed response must not be

regarded as proof of labyrinthine impairment, for the meatus, in those circumstances, is not so rapidly cooled down as in health. Again, a collection of cholesteatomatous material in the attic may also interfere with the conduction of heat, and so delay the appearance of the reaction. Thus, polypi and granulations should be removed, and cholesteatomatous masses cleaned out, before the tests are applied. In cases of cholesteatomatous disease, etc., the danger of washing septic matter from the meatus into the deeper recesses of the middle ear should not be forgotten, and the meatus should be thoroughly cleansed by swabbing with an antiseptic before syringing; while the liquid used for douching should consist of alcohol and water in equal quantities.

If, when every care is taken to eliminate fallacy, the response to the rotation and caloric tests shows that the vestibular function is depreciated on one side compared with the other, the presence of a circumscribed lesion of the labyrinth may be diagnosed. In cases, in which the responses to the tests are normal, and in which the history of marked vertigo has raised the suspicion that there is labyrinthine disease, Bárány has suggested the adoption of a further method of interrogating the labyrinth. The air in the meatus is submitted to condensation or rarefaction, by means of a tightly fitting Siegle speculum provided with a large inflating bag. If now nystagmus and vertigo result, the previous responses to the rotation and caloric tests having been normal, the diagnosis of a fistula in the outer wall of the labyrinth is certain.

But when all is said and done, the responses, in many cases of circumscribed septic labyrinthitis, are those of health, and the first knowledge of labyrinthine complication is the discovery, during the performance of the mastoid operation, of a fistula, or a carious patch covered with granulations, in the outer wall of the labyrinth. The corollary of this fact is, that in chronic middle-ear suppuration, when intermittent vertigo is a symptom of the case, the radical mastoid operation should at once be performed, and the outer wall of the internal ear inspected.

Regarding the treatment of circumscribed infective labyrinthitis, considerable difference of opinion and practice exists. It is generally acknowledged that many, perhaps most, of

these lesions heal up of their own accord after the radical mastoid operation has been performed. This being so, most otologists prefer to await the results of the simpler operation before proceeding to attack the labyrinth. And this is perhaps always advisable when the hearing of the affected ear is not seriously injured. On the other hand, it is contended that spontaneous cure of the labyrinthine lesion, after the radical mastoid operation, does not invariably occur, and it has been sometimes found, moreover, that, even after all active disease in the labyrinth has dried up, severe vertigo persists, and prevents the patient from leading an active life. These considerations have induced some authorities to promulgate the doctrine that the complete mastoid-labyrinth operation should be performed in all cases of circumscribed infective labyrinthitis. There is one point upon which probably both opposing schools would agree, and that is, that granulations on the outer wall of the labyrinth, covering a spot of caries, or springing from the edges of a fistula, should be severely left alone when the simple mastoid operation is being performed, unless the surgeon is prepared, on the first indication of an advance of the disease in the labyrinth, to complete the operation later by opening up the labyrinth.

Nystagmus in Non-suppurative Labyrinthine Diseases.—The reactions to the vestibular tests in cases of total destruction of the labyrinth, such as occurs in syphilis, arterio-sclerosis, etc., are the same as those found in complete destruction of the labyrinthine function from acute infective inflammation. That is to say, the normal responses are completely lost. In most of these cases both labyrinths are, as a rule, equally affected.

The utility of the tests in non-suppurative circumscribed labyrinthitis is only now being investigated, and the results obtained are not yet sufficiently perfected to permit of any definite pronouncement. My own results may be briefly summarised as follows :—

In simple chronic catarrh of the middle ear, without any signs of perceptive deafness, the tests produced a normal reaction. In several cases of otosclerosis, the nystagmus induced by cold was delayed and imperfect, independent of the degree and character of the deafness. A different result has been reported by Pike⁴ in this disease. He found in the majority of cases of

otosclerosis tested by himself and Bárány that the vestibular irritability was increased, even when the deafness was very severe.

In syphilitic labyrinthine disease, I found that impairment of vestibular sense was denoted by delay or absence of the normal reactions. In one case of very grave perceptive deafness from the congenital disease, however, the vestibular responses were quite normal, showing that the disease had spared the vestibular region. This case would seem to be quite exceptional, for other observers report an invariable destruction of the vestibular sense as well as of the hearing, in congenital syphilis of the labyrinth.

In perceptive deafness from unknown causes, the nystagmus was found to be delayed, and the normal vertigo lessened, pretty much in proportion to the amount of deafness present.

Finally, in two cases of hysterical deafness, in one of which the loss of hearing was absolute, the tests showed an entire absence of vestibular irritability.

Summing up these results, it would be possible to say; first, that when destructive processes cause perceptive deafness, they generally cause a proportionate amount of damage to the vestibular organ of equilibration; secondly, that an exception to this rule is found in otosclerosis, where the amount of loss of hearing seems to bear but little relation to the amount of impairment of the vestibular sense.

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THE SIGNS AND SYMPTOMS OF THORACIC ANEURYSM.

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INTRODUCTION.

THE diagnosis of an aneurysm may be so simple that a mistake is impossible, or it may be so difficult, even when the sac is large, that an accurate observer may weigh each point deliberately, and finally arrive at an erroneous conclusion. Hilton Fagge defined an aneurysm as "a circumscribed tumour containing fluid or clotted blood communicating directly with the lumen of an artery, and limited by the tissue, which is called the sac." This wide definition may be accepted, and no distinction drawn between saccular and fusiform aneurysms.

I.—ANATOMY.

The thoracic aorta is divided into four parts, viz.: the ascending transverse and descending parts of the arch, and the descending thoracic aorta. These divisions correspond with the main changes in direction, but their limits are somewhat arbitrarily fixed, and throughout each division the relation to the surrounding structures rapidly varies.

Ascending Part of the Arch.—The aorta arises from the posterior and upper part of the left ventricle on a level with the lower border of the third costal cartilage and slightly to the left of the middle line of the sternum. It passes upwards and to the right to the upper border of the second right costal cartilage, close to its junction with the sternum, where this portion of the arch terminates. Its length is about $2\frac{1}{4}$ inches. It is surrounded throughout by the fibrous layer of the pericardium, and, for the greater part of its course, is enclosed by a sheath of serous pericardium, common to it and the pulmonary artery. At its origin the aorta is overlapped by the right auricular appendix and the pulmonary artery. As these diverge, it is separated from the sternum

by the tissues in the superior mediastinum, and is slightly overlapped by the right pleura and edge of the right lung. Posteriorly it is in contact with the left auricle, the right pulmonary artery, and the right bronchus. To the right are the right auricle and superior vena cava, and to the left the pulmonary artery.

The Transverse Part of the Arch.—The second part of the arch commences at the upper border of the second right costal cartilage, and terminates at the upper margin of the fourth dorsal vertebra on the left side. Its direction is to the left and somewhat backwards, and it arches across the third dorsal vertebra with its concavity upward, so that its apex is about $1\frac{1}{2}$ inches below the suprasternal notch.

It is separated from the sternum by the pleuræ and lungs. It crosses the bifurcation of the trachea, the œsophagus, and the thoracic duct. Above are the three large arterial trunks, and the left innominate vein is in close relation to it. Below, in its concavity, are the pulmonary artery, the left bronchus, and the superficial cardiac plexus with the ganglion of Wrisberg. It is crossed by the left phrenic, vagus, and cardiac branches of the sympathetic, whilst the left recurrent laryngeal nerve winds round it. Neither this nor any other part of the arch has any intimate relation with the trunk of the sympathetic.

The Descending Part of the Arch.—This part extends downwards by the left side of the bodies of the fourth and fifth dorsal vertebræ. The remains of the ductus arteriosus extend between it at its commencement and the pulmonary artery. Below this, it often narrows into the "isthmus" and then again enlarges to form the "spindle." In front it is in contact with the structures forming the root of the left lung. Behind and to the right are the bodies of the fourth and fifth dorsal vertebræ. To the right lie also the œsophagus and thoracic duct. On the left it is in contact with the left pleura and lung.

The Descending Thoracic Aorta.—This extends from the lower margin of the fifth dorsal vertebra to the aortic opening in the diaphragm opposite to the twelfth dorsal vertebra. At its commencement, it lies to the left of the bodies of the vertebræ, but it has a general inclination to the right, and, at its termination, lies almost in the mid line. It is

situated in the posterior mediastinum, and is separated from the pericardium and the heart by the œsophagus, which crosses in front of it from the right to the left. Towards its termination it is in contact with the diaphragm. Laterally it is in relation to the left pleura and lung above, and then to the right pleura and lung lower down. Behind, it is in contact with the last seven dorsal vertebræ, at first lying to their left, and then immediately in front of them.

II.—ÆTIOLOGY.

Age.—Thoracic aneurysm is commonest between the ages of 35 and 50, corresponding, as is generally said, with the period of greatest bodily vigour.

Sex.—Aneurysm is nearly ten times commoner in men.

Syphilis.—A history or proof of syphilis is found in aneurysm in a percentage varying between 65 and 85, according to different observers. This proportion is in itself striking, but the importance of syphilis is further emphasised by recent pathological research, from which the conclusions are drawn that the histological basis of thoracic aneurysm is a mes-aortitis, and that this lesion has a syphilitic origin. The evidence in favour of these views must be considered conclusive as applied to the great majority of cases, but they have not been proved to be universal, and it is not justifiable, at present, to assert that there can be no thoracic aneurysm without syphilis. It is possible indeed to recognise a small group of cases of aneurysm occurring in subjects, aged 50 years and upwards, in which the aorta is atheromatous, but does not show the changes characteristic of mes-aortitis.

It may be noted that the age-incidence of thoracic aneurysm resembles that of general paralysis of the insane.

Occupation.—It has long been held that thoracic aneurysm is common amongst those engaged in laborious pursuits. Definite evidence is difficult to obtain. The result of strain is to raise the blood-pressure. Sir Clifford Allbutt called attention to the factor of high blood-pressure many years ago. Against its influence, it has been pointed out that, in thoracic aneurysm, the blood-pressure is not remarkably high, and the left ventricle is usually not hypertrophied; also that, in many cases, there is no suggestion of strain. With regard

to the first two points, Clifford Allbutt replies that temporary high pressures are sufficient for his argument, and would not result in cardiac hypertrophy.

With the increasing importance ascribed to syphilis, the question of occupation must be placed in a secondary position ; but, even so, strain probably will prove to have considerable influence on the formation of an aneurysm in a diseased aorta.

Arterio-Sclerosis.—Before mes-aortitis was distinguished from other arterial degenerations, the relation of arterio-sclerosis to aneurysm was much debated. Disease of the aorta was almost invariably found, but it was observed that the greatest age-incidence of aneurysm was far earlier than that of arterio-sclerosis. Coats considered that aneurysm coincides with the time of life when the period of greatest bodily vigour overlaps the period of occurrence of atheroma.

Mes-aortitis and atheroma are, however, very frequently co-existent, and since arterio-sclerosis, in its widest sense, means "thickening of the arteries," the condition of the radials may be an aid in the diagnosis of aneurysm.

These three factors, syphilis, strain, and arterio-sclerosis, are frequently difficult to separate.

III.—SYMPTOMS.

The most important symptoms of aneurysm are due to pressure on other structures. They will be dealt with as : (1) Pain ; (2) Respiratory System, affections of ; (3) Hæmorrhage ; (4) Dysphagia.

(1) *Pain.*—Pain is the most constant symptom of aneurysm. There are so many causes for it that but few cases escape. But the number of causes leads to every variety of persistence, severity, and position, and the result is frequently misleading.

The Causes of Pain.—During the gradual dilatation of the artery, the nerve-endings in the wall are stimulated and pain results. This pain, true aneurysmal pain, is reflected over certain areas, and may be accompanied with recognisable superficial tenderness. It is more or less continuous, usually not very severe, and is especially subject to nocturnal exacerbations. These nerve-endings are also subject to rapid stretching, due to temporary conditions of stress, resulting in severe paroxysms of pain.

There is a limitation to the occurrence of pain of these types. The sac of large old aneurysms is formed of structures in which the original arterial wall has little part. In agreement with this, one finds that pain of this character occurs in small early aneurysms, and tends to disappear as they become large.

In accordance with what might be expected, pathological conditions of the heart occur in aortic aneurysm. Hypertrophy of the left ventricle is found in not more than half the cases, and aortic incompetence in a much smaller proportion, but both these conditions are found more frequently with aneurysms which arise immediately above the valves. Accordingly, with aneurysms at this site, one frequently finds ordinary cardiac pain of all grades of severity ranging up to a condition which is not only indistinguishable from, but may be regarded as identical with, true angina.

Pain is also associated with pressure on and erosion of structures. Pressure on sensory nerves produces paroxysms of pain radiating, for example, along the line of the ribs. Erosion of bone is a frequent cause of pain in aneurysm. The sternum suffers particularly in aneurysms of the ascending and transverse parts, and the vertebræ and ribs in those from the descending arch and aorta. There is irregular neuralgic pain often persisting for years with tenderness on pressure over the site of erosion. Most severe of all are the excruciating pains which occur when the vertebræ have been eroded, and the sac is in contact with the dorsal nerve roots.

Pain as a Symptom.—Considering pain as a symptom, one finds it is of two distinct kinds, the one acute, paroxysmal, and subject to long remissions, and the other, dull, and more or less constant. The more persistent pains may be due to pressure on and destruction of bone and other structures, or to gradual dilatation of the aorta and stretching of the nerves causing true aneurysmal pain. Paroxysmal pain affecting the dorsal and cervical areas is always suggestive of aneurysm. We have found various causes for it. It may be, first, true angina pectoris, secondly anginoid, an exacerbation of milder aneurysmal pain from sudden stretching of the aorta, and thirdly referred pain from pressure on sensory nerves.

The Site of the Pain.—The position in which pain may occur

is of importance. With regard to aneurysmal pain, Dr. Head has shown that the areas, affected by pain reflected from the aortic arch, are those corresponding with the third and fourth cervical, and the first four dorsal segments. The lower border of the fourth dorsal area is fairly represented by the level of the nipple. The third and fourth cervical areas cover the shoulders and neck as low as the second rib anteriorly, and as high as the occiput posteriorly. The fifth, sixth, seventh, and eighth cervical areas represent the radial side of the upper arm, forearm, and hand, and the thumb, and first three fingers. When the third and fourth cervical areas are affected, there is frequently the temporal and fronto-temporal headache associated with these areas. With aneurysms arising from the sinuses of Valsalva, there may be no pain, or there may be præcordial pain indistinguishable from that of aortic incompetence.

With origin immediately above the sinuses, pain is felt over the third and fourth ribs spreading into the right shoulder. In general, the higher the origin of the aneurysm in the ascending part of the arch the higher is the pain felt.

As the transverse part is reached, the pain tends to be referred to the left shoulder instead of to the right. Thus an aneurysm, arising from the commencement of the transverse arch to the right of the sternum, causes pain over the sternum, and commonly in the left shoulder and arm, but may affect the right shoulder and arm. The farther the origin is to the left, the more it tends to affect the areas on the left side. When arising from the summit of the arch, the back of the neck and shoulders are affected and sometimes the throat.

Dr. Head has shown that, below the entry of the ductus arteriosus, pain is reflected to the fifth, sixth, and seventh dorsal areas. Thus, aneurysms arising below this point do not cause pain in the upper limb or shoulder. The pain is felt in the interscapular region on the left side, and below the left breast, and the lower the position of the aneurysm the lower is the position of the pain.

The pain due to erosion of bone is felt locally at the position affected. When pressure occurs on nerve-trunks, the pain is referred to the distribution of the sensory fibres. Thus, when the intercostal nerves are affected, as not un-

commonly happens, the pain radiates round the trunk. The distribution of the lower intercostal nerves leads to the pain being referred from these to the abdominal wall. Excruciating pain in this position occurs, when an aneurysm has eroded the vertebræ, and is pressing on the dorsal nerve roots.

It can be seen that pain, as a symptom of aneurysm, is of great importance. In any case of obstinate, or constantly recurring pain, for which no disease can be found to account, aneurysm should be considered. The paroxysms are so striking and emphatic as to be rarely overlooked, but the milder aneurysmal pain, particularly subject to nocturnal exacerbation, but otherwise dull, persistent, indefinite, and undramatic, is a constant symptom of early aneurysm.

(2) *Respiratory Symptoms.*—The commonest symptoms next to pain are those associated with the respiratory tract. The most characteristic of these arise from pressure on nerves rather than on solid structures. For convenience the disturbances due to involvement of the recurrent laryngeal nerves will be dealt with first as a whole.

Involvement of the Recurrent Laryngeal Nerves.—The recurrent laryngeal nerve supplies all muscles of the larynx, except the crico-thyroid, which is supplied by the superior laryngeal. Consequently this muscle, which is a tensor of the vocal cords, always escapes the action of thoracic aneurysms. The other muscles are divided into abductors and adductors of the vocal cords. The only abductors are the posterior crico-arytenoids. The rest are all adductors, but the internal thyro-arytenoid also acts as a tensor of the cords.

Now it is found that, after death, when all the muscles are paralysed, the vocal cords are much closer together than during normal quiet respiration. They assume what is known as the "cadaveric position," the width of the rima glottidis being reduced to about one-third. The greater width during life is ascribed to a reflex tonus of the abductors. In a sudden lesion of the recurrent laryngeal nerve there is naturally complete paralysis of all muscles, and the cords assume the "cadaveric position." But when the recurrent laryngeal is subject to a slow progressive organic lesion, it may be held, as a law, that the abductors are affected considerably more and earlier than the adductors. Semon states that there is no

well-authenticated exception known.

The position of the left recurrent laryngeal, as it hooks round the arch of the aorta, causes it to be affected much more frequently than the right nerve. Abductor paralysis indeed is nearly always unilateral and organic, whilst adductor paralysis is usually bilateral and functional. Semon has traced the phases which occur when an aneurysm of the transverse arch presses on one recurrent laryngeal nerve. The first stage is unilateral abductor paralysis, and the cord gradually recedes into the cadaveric position. The voice is normal because the adductors are still acting, and can thus draw the affected cord into the position of phonation. There is no dyspnoea at this stage. Thus there need be no laryngeal symptoms.

In the second stage, the adductors, their action being unopposed, undergo "paralytic contracture," as will any unopposed muscles. The cord is thus dragged into the middle line. It is now in the correct position for phonation, hence there may be no appreciable change in the voice. Since the paralysis is unilateral, the opening is still sufficient for quiet respiration, and there is no dyspnoea except on exertion. Thus even at this stage there may be, and frequently is, no symptom calling attention to the larynx.

Dyspnoea will, however, be present on exertion accompanied by some inspiratory stridor. In many cases also, some adductor paralysis co-exists at this stage, and leads to changes in phonation. The earliest adductor to suffer is the internal thyro-arytenoid, and the loss of its tensor action on the vocal cords usually leads to some change in the voice at the time of the earliest symptoms of dyspnoea. Adductor paralysis is frequently revealed by the so-called "bovine" cough. This is a long wheeze without an initiatory explosion. It is due to the fact that, when there is paralysis of the adductors, the glottis cannot be closed. In a natural cough the first act is a forcible closure of the glottis, and the cough commences with an explosive element. When the glottis cannot be closed, the explosion does not occur. This characteristic may reveal adductor paralysis, even when there is no alteration of the voice such as to attract attention. The involvement of both recurrent laryngeal nerves simultaneously is extremely rare in thoracic aneurysm, and, in such a case, dyspnoea with inspira-

tory stridor is an early symptom. There is no doubt that irritation of one vagus trunk may cause bilateral spasm of all the glottic muscles, the greater strength of the adductors causing approximation of the vocal chords. The spasm may be of any degree, and, when severe, will lead to an amount of asphyxia which justifies and demands tracheotomy. It is said, on good authority, that pressure on one vagus may result in bilateral paralysis of the abductors, but such cases must be considered as curiosities.

From a consideration of these phenomena we find:—

(1) Abductor paralysis is often the first physical sign of aneurysm. It may give no symptom. Therefore it must be looked for. The examination of the larynx should never be omitted in the diagnosis of aneurysm. The symptoms, when they occur, are dyspnœa with inspiratory stridor, cough, and some alteration in voice from the co-existing adductor paralysis.

(2) Adductor paralysis is of later occurrence. It is revealed by the “bovine” cough and alteration in the voice.

(3) Unilateral laryngeal paralysis is shown by a combination of the symptoms of abductor and adductor paralysis, that is to say, by a “bovine” cough, with even slight degrees of dyspnœa or inspiratory stridor. In the absence of any obvious disease to account for it, this is almost conclusive of intra-thoracic tumour.

The respiratory symptoms fall into three groups: (i) Cough; (ii) Dyspnœa; (iii) Alteration in the voice.

(i) *Cough*.—Aneurysm tends to cause cough by pressure on the trachea or main bronchi, frequently accompanied with pressure on the recurrent laryngeal nerve. Consequently the cough, due to an aneurysm, is usually a cough with a peculiarity. This may be of character, being paroxysmal, or it may be of tone. The cough may be of the “bovine” type mentioned above, or it may possess the metallic ring which is associated with tracheal pressure, and known as “brassy.” A paroxysmal cough with one of these peculiarities of tone constitutes one of the most distinctive symptoms of aneurysm. A cough of normal character occurs when an aneurysm is compressing large areas of lung.

At first, with cough due to pressure on the air-tubes, there is little or no expectoration, but as catarrh develops it increases

until there is copious frothy sputum. As the obstruction increases, the amount may diminish whilst the patient makes incessant ineffectual efforts to get rid of it.

(ii.) *Dyspnœa*.—Aneurysm may cause dyspnœa by direct pressure upon and narrowing of the trachea, or by involvement of a recurrent laryngeal nerve, usually the left, as described previously. These causes frequently co-exist. The peculiarity of such dyspnœa is that it occurs in acute paroxysmal attacks accompanied with inspiratory stridor. This is sometimes the earliest symptom of aneurysm when arising from the transverse part of the arch. The laryngoscope usually confirms the diagnosis. With it pathological conditions of the laryngeal mucous membrane are excluded, especially syphilitic and tuberculous lesions, and one or both of the cords found in the cadaveric position. Similar attacks of dyspnœa of a most severe degree can be ascribed to the bilateral spasm of the glottic muscles. Constant dyspnœa without stridor may occur when a large aneurysm is compressing lung tissue, or a bronchus is obstructed. The importance of the paroxysmal dyspnœa lies in its danger. Next to rupture of the sac it is the commonest cause of death in aneurysm.

(iii.) *Voice*.—An alteration in the voice is not infrequently the first symptom to attract a patient's attention, but it may be not noticeably affected even when there is paralysis of the vocal cords and dangerous dyspnœa. This has already been discussed. The commonest change is hoarseness, but there may be simple weakness, or the voice may become tremulous. Aphonia may become complete.

Since all these respiratory symptoms are mainly caused by pressure on the air-tubes and nerves, they are early and severe with aneurysms of the transverse arch, especially those arising from the posterior aspect, later with those of the descending arch, and absent or slight with those of the ascending arch and descending aorta. Their common characteristic is their paroxysmal nature. A cough out of all proportion to the catarrh or expectoration, or a dyspnœa at one moment extreme and at another absent, suggests aneurysm. If pain is present, and the cough has the laryngeal character, then the diagnosis is almost certain.

(3) *Hæmorrhage*.—Hæmorrhage from rupture of the sac

is the commonest cause of death in aneurysm, but in many cases the rupture is internal, into the pleura or pericardium. Rupture on the surface of the body through the skin is extremely rare. Aneurysm is the commonest cause of fatal hæmorrhage, being commoner than hæmatemesis or phthisis. Before the fatal hæmorrhage there are usually smaller ones, the first rarely being fatal. This is due to the fibrin which coats such aneurysms and promotes clotting of the blood. Even after a severe loss of blood, life may be prolonged for years, but, in most cases, between the first profuse hæmorrhage and the final event, there is not more than a few weeks. Smaller hæmorrhages, sufficient to tinge the sputum, may extend over months, and be due to several causes :—

(1) The blood may come from granulations in the trachea.

(2) The sac may be exposed in the air-tubes and “weep” through.

(3) The blood may come from the alveoli, and be due to pressure on the pulmonary veins.

Hæmorrhage into the air-tubes and œsophagus is most common in aneurysm of the transverse arch.

(4) *Dysphagia*.—Dysphagia is rarely a severe or early symptom of aneurysm. It may be due to direct compression of the œsophagus or to pressure on the vagus resulting in spasm. The pain is not uncommonly referred to the ensiform cartilage. The importance of dysphagia is that it may appear consistent with intrinsic stricture of the œsophagus, and a sound be passed with great risk of rupturing the sac. In cases of dysphagia, aneurysm must always be excluded before a sound is used.

IV.—PHYSICAL SIGNS.

As physical signs, are included all data which can be obtained by examination of the patient. Those more immediately connected with the aneurysm will be considered first, and then those due to pressure on other structures.

A.—*Signs directly connected with the Aneurysm. Inspection and Palpation*.—It is best to commence the examination of the thorax by locating the cardiac impulse. By its position, this may indicate the presence of hypertrophy of the left ventricle, or dislocation of the heart. With regard to disloca-

tion, this occurs most frequently with aneurysms of the ascending only, or ascending and transverse parts of the arch. The displacement is almost invariably directly to the left, or downwards and to the left, and it is shown by the variation in the position of the impulse without other signs of cardiac enlargement. Hypertrophy of the left ventricle is present in about half the cases of aneurysm. It is not due to aneurysm *per se*, but is caused by the co-existence with it of aortic incompetence or atheroma. The thorax must next be examined anteriorly and posteriorly for a pulsating swelling.

The pulsation of an aneurysm is best observed, and sometimes only observed, at the end of a forced expiration. The area cannot be far from the main line of the aorta. Thus anteriorly it is usually found to the right of the sternum and in the suprasternal notch; whilst, posteriorly, it is only found to the left of the spinal column in the interscapular or infrascapular regions.

The particular feature of an aneurysm is that the pulsation is expansile, this characteristic distinguishing it from pulsation communicated from the aorta to an overlying tumour.

A vascular sarcoma may pulsate, but in the thorax these are extremely rare. Apart from this, expansile pulsation, when obtained, is pathognomonic of aneurysm, but it may be a most difficult physical sign of which to be certain. It is best judged in doubtful cases by a combination of hand and eye. A half-light throwing a shadow from the tumour is used, while the eye is placed on a level with the chest. At the same time, the hand grasps the swelling from side to side, or little strips of paper, bent at a right angle, may be laid upon it with one side erect, and their movements watched. By these means an expansile character can often be detected which is not otherwise noticeable. But while the expansile character is a practically conclusive sign, yet its absence does not negative an aneurysm. Even large and prominent aneurysms may not be expansile owing to the exposed portion of the sac being lined with clot.

Two other important phenomena, connected with palpation of the pulsating area, are a systolic thrill and a diastolic shock. The systolic thrill may be as definite as the thrill of a pure mitral stenosis, or it may merely give the impression of vibra-

tion to the hand. It is due partly to vibrations of the wall, and is usually absent when the sac is lined by laminated clot. It is associated with the systolic murmur referred to below. When present this is an important sign. The diastolic shock only occurs with aneurysm of the ascending arch. It is felt as a distinct jog. It is due to the recoil against the aortic valves of the blood which has been forced into the aneurysm, and is associated with an accentuated aortic second sound and a loud diastolic sound heard over the sac. It is consequently absent when the aortic valves are incompetent. It is by no means common.

The points revealed by inspection and palpation are therefore: (1) Pulsating tumour. (2) The expansile character. (3) Systolic thrill. (4) Diastolic shock.

If all are present, the diagnosis is easy, but all may be absent. Any one may be present alone (except of course expansion). A diastolic shock may be conducted to the thoracic wall when no pulsation can be found.

Percussion.—The cardiac dulness should first be mapped out, its boundaries being carefully marked to distinguish it from other dulness which may subsequently be found. Abnormalities of the cardiac dulness, when an aneurysm is present, may be due to hypertrophy or dislocation. The dulness of an aneurysm is situated anteriorly, usually to the right of the sternum or over the manubrium, and posteriorly to the left of the vertebral column. Though no pulsation may be recognisable, an aneurysm lying in contact with the thoracic wall will give a dull note and a sense of resistance. It is advisable to confine the examination to light percussion.

Auscultation.—With regard to the heart itself, the commonest lesion is aortic incompetence. This is far from common, but becomes more frequent the nearer the aneurysm is situated to the aortic valves. The character of the aortic second sound, when the valves are competent, is of great importance. With aneurysms of the ascending part of the arch it is booming and accentuated. So constant is this sign that it can be said, on good authority, that aneurysms should not be diagnosed in this position when the aortic second sound is normal. The accentuation is due to the same causes as the diastolic sound

which may be heard over some aneurysms.

On listening over the aneurysm, one may hear either murmurs, or sounds which are of the nature of normal cardiac sounds. The murmurs heard may be conducted from the heart ; for example, when there is aortic incompetence, the diastolic murmur will be heard over a sac situated near the valves. True aneurysmal murmurs are produced in the sac itself. This is shown by their being confined to the pulsating or dull area, when such exists, and their difference in quality or quantity from the cardiac sounds.

The commonest is a "systolic" murmur. This is the audible counterpart of the systolic thrill and may be very intense. The murmur is frequently present when no thrill can be felt. It is synchronous with the expansion of the sac, and is not truly systolic. It is the only murmur of any importance. It must be remembered that a systolic murmur may be heard over parts of the chest when there is no suggestion of aneurysm. More rarely there is a double murmur produced in the sac at its expansion and recoil, but usually a diastolic murmur is due to aortic incompetence. Occasionally, an aneurysm ruptures into the superior vena cava or an innominate vein, thus producing a varicose aneurysm. In such a case a continuous humming murmur, increasing with each systole, will be heard. With this there will be signs of venous congestion and pulsation, and a thrill will often be palpable in the veins.

Even over a large aneurysmal sac there is frequently no murmur at all. This may be due to fibrin preventing vibrations of the wall, but it depends also on many other factors, such as the size of the opening into a saccular aneurysm. With regard to sounds heard over the aneurysm, these resemble normal cardiac sounds, with aneurysms of the ascending aorta, a booming diastolic sound may be present. This is the audible counterpart of the diastolic shock, and is due to the same causes. Therefore it does not occur without the accentuated aortic second sound. When present it is of the greatest importance. It is indeed the only important auscultatory sign. All sounds heard over an aneurysmal sac tend to have a reverberating character. The character of the aortic second sound is certainly the most important point on auscultation. A normal sound is evidence against, and an accentuated one in favour of aneurysm, whilst a diastolic murmur may be regarded as neutral.

Summary of Physical Signs of Aneurysm.

- Inspection - Tumours, Expansile Pulsation.
 Systolic Thrill.
 Diastolic Shock.
- Percussion - Extra-cardial Area of Dulness.
- Auscultation - Systolic Murmur.
 Loud Diastolic Sound.
 Aortic Second Sound accentuated, or
 replaced by a murmur.

B. *Pressure Signs*.—Next we come to the important group of signs due to pressure of the aneurysm on various structures.

These will be described as:—(1) Pressure on Arteries; (2) Pressure on Veins; (3) Pressure Signs connected with the Pupils; (4) Pressure on Air-Tubes; (5) Pressure on Nerves.

(1) *Pressure on Arteries*.—The signs of interference with the systemic arteries is found in abnormalities of the pulse. The radial pulses may both vary in character from the normal, or they may be asynchronous or unequal in force.

An aneurysm low down in the ascending aorta can cause no difference in time or volume between the two pulses. It may, however, modify both. The size and expansion of an aneurysmal sac tends to neutralise the pulse-wave. It may be compared with a reservoir, into which an intermittent stream runs, and out of which a constant stream flows. In this maximum effect there will be no pulse-wave at all beyond the sac. Aneurysms of the ascending arch are never large enough to produce this result, but, with a large aneurysm of the descending aorta, no pulse may be palpable in the femoral arteries, as Osler has pointed out. But though an aneurysm of the ascending arch cannot produce so marked an effect, it may cause it in milder degrees, and result in a pulse with a long rise to a flat apex, resembling the pulse of aortic stenosis. An aneurysm in any position may produce such a pulse in the arteries distal to it.

With aneurysms high up in the ascending part of the arch, the sac often reaches and compresses the subclavian artery. The right pulse thus becomes smaller in volume than the left but synchronous with it. The temporals may or may not be affected. With aneurysms arising from the transverse arch, the pulses tend to be asynchronous, the apex on the left being delayed after that on the right. This delay is mainly due to

the reservoir action of the aneurysm. With aneurysms arising from the descending arch beyond the origin of the great vessels, the sac may compress the left subclavian artery, and the pulse becomes less in volume than on the right side but synchronous with it. A large aneurysm of the descending (or abdominal) aorta may cause obliteration of the femoral pulse.

These may be described as the classical effects of aneurysms on the pulse. They may occur typically, and in any degree, and may be shown by a comparison of sphygmograms from the two radial pulses. Theoretically the localisation of an aneurysm should be easy in such cases, but in practice several factors introduce disturbing influences. Thus the walls of an old aneurysm may be thick and inelastic. In such a case, the distal circulation may be unaffected by its presence. Again clot from an aneurysm, at any site, may block the entrance of any of the great vessels beyond it, and thus affect the pulse. Thus aneurysm of the ascending arch may lead to partial blockage of the left subclavian artery and diminution of the left radial pulse. Hence variations in the radial pulses are of great importance in diagnosing the existence of an aneurysm, but are of little weight in deciding its position.

(2) *Pressure on Veins.*—Aneurysms are less apt to cause severe obstruction of the veins of the thorax than are malignant and glandular tumours. But it is not uncommon to find some degree of interference, especially by aneurysms of the ascending aorta. The signs are dilatation of the superficial veins, and œdema. Compression of the superior vena cava causes lividity of the face with œdema, and dilated veins over the upper half of the body. The neck is especially swollen. Either innominate vein may be affected singly, but the left is the most common, owing to the frequency with which aneurysms of the transverse arch obstruct it. The area of the signs will be limited accordingly to either side. Slight pressure results are often seen, and dilated veins and œdema, with such distribution, are always suggestive of intrathoracic obstruction. Unilateral clubbing of the fingers occasionally occurs on the corresponding side. In such cases the other signs of compression are not marked. Pressure of a sac upon the right auricle, in rare cases, may obstruct the orifice of the inferior vena cava, and lead to signs of venous congestion over the lower half of the body.

Pressure on the pulmonary artery is common, and is associated with various degrees of general venous congestion and engorgement of the right side of the heart. The sac not infrequently ruptures into a venous trunk which it has previously compressed. Rupture into the superior vena cava will be followed by severe cyanosis and increase of the signs of venous congestion. Rupture into the pulmonary artery is followed by rapid death.

(3) *Pressure Signs connected with the Pupil.*—Inequality of the pupils is very commonly present with aneurysms of the aortic arch. This inequality may be due either to involvement of the sympathetic nerves, or to interference with the circulation through the carotid, and, consequently, through the ophthalmic arteries. The connection of the sympathetic nerve with the pupil is due to the path of the fibres supplying the dilator pupillæ. These emerge from the central nervous system mainly by the first two dorsal nerves, and reach the iris by way of the cervical sympathetic trunk, the ophthalmic branch of the fifth cranial, and the long ciliary nerves.

Now when the sympathetic nerve is involved in any growth and paralysed, the action of the third nerve is unopposed, and the following phenomena are present:—

(1) The inequality of the pupils is marked.

(2) The smaller pupil does not dilate on shading, or with cocaine.

(3) Other signs of sympathetic paralysis are present, such as unilateral pallor of the face on the side of the small pupil, exophthalmos, pseudoptosis, and other ocular signs.

These phenomena are occasionally present in aneurysm, and so one is justified in saying that inequality of the pupils with an aneurysm is occasionally due to interference with the sympathetic nerve. But they are extremely rare.

Almost invariably one finds:—

(1) The inequality of the pupils is slight. Frequently it can only be observed in a dull light.

(2) Both pupils dilate on shading, or with cocaine.

(3) No other signs of sympathetic paralysis are present. Drs. Wall and Walker called attention to these points some years ago, and suggested the following explanation, which they supported by experiments and confirmed by observation.

It is known that the arteries of the iris have a spiral arrangement. When the blood pressure rises they tend to straighten and the pupil contracts. When the blood pressure falls they retract and the pupil dilates. These effects are illustrated, on the one hand, in cases of "granular kidney," where the blood pressure is high and the pupils contracted, and, on the other hand, in cases of chlorosis, where the blood pressure is low and the pupils dilated. Such variations in size are due to the local differences in blood pressure, and are not concerned with the general circulation. Thus compression of one carotid artery in man will cause dilatation of the pupil on the same side and temporary inequality.

In agreement with these observations, it is found that, when the pupils are unequal in cases of thoracic aneurysm, the larger pupil is on the same side as the smaller carotid pulse. Hence it is concluded that the inequality of the pupils in thoracic aneurysm is due to inequality of the blood pressure in the ophthalmic arteries.

In the examination of the pupils, it should be remembered that :—

- (1) Inequality is not uncommon in normal individuals.
- (2) The inequality in aneurysm is usually slight. Frequently it can only be observed when the eyes are shaded.
- (3) Inequality may be present when no difference between the carotid pulses can be detected by the finger.
- (4) No localisation of the aneurysm can be deduced from the inequality. The reason for this has been discussed under "Inequality of the Pulse."

(4) *Pressure on Air-tubes. Displacement of the Trachea.*—Any lateral deviation of the trachea is of great importance. It can be judged by drawing a line from the prominence of the thyroid cartilage to the exact centre of the suprasternal notch, and noting any deviation of the trachea to right or left.

"*Tracheal Tugging.*"—This physical sign is associated with pressure on the bifurcation of the trachea. It does not occur with aneurysms of the ascending arch, is common with those of the transverse arch, and is frequently an early phenomenon when they arise from the concavity of the descending arch. To be of importance, a distinct sense of traction downwards must be appreciable. To a slight extent tracheal tugging occurs normally. It can be usually felt at the end of a

forced inspiration, and is sometimes quite distinct in emphysema. In these cases, it has been explained by the descent of the root of the lung bringing it into close relations with the base of the heart. When examining for this sign, the patient's head should be thrown well back. The observer runs the thumb and first finger up the trachea until they rest upon the cricoid cartilage. This is pressed gently upwards. The examination is most satisfactorily performed when standing behind the patient.

Alteration in the Breath Sounds.—Even when no other physical signs are present, pressure on air tubes may lead to alteration in the respiratory sounds which show that the access of air has been interfered with. The left bronchus is most commonly affected, and may be compressed by even a small aneurysm arising from the descending arch. When this occurs there is frequently paroxysmal dyspnoea and paroxysmal cough, although this may have no laryngeal tone and the recurrent laryngeal nerve may not be affected. Hence "asthmatic" attacks with signs of obstruction to one bronchus, especially the left, is suggestive of an aneurysm. On examination of the affected lung in such cases, in the early stages there is no dulness, the vocal fremitus and resonance are slight, rales are numerous, and the breath sounds are diminished but not tubular. As the obstruction increases, and the secretion is retained, the percussion note becomes defective. A large portion of a lung may be directly compressed by an aneurysm and give the usual physical signs.

(5) *Pressure on Nerves.*—The only motor nerve commonly affected is the recurrent laryngeal. This has already been discussed. The phrenic is never involved.

Summary of Pressure Signs of Aneurysm.

- i. Inequality and variations of the pulses.
- ii. Dilated veins and œdema.
- iii. Inequality of the pupils.
- iv. Deficient air-entry into the lungs.
- v. Laryngeal paralysis.

V.—LOCALISATION.

The phenomena, associated with thoracic aneurysms at their various positions, will now be briefly considered. The

anatomical divisions will be followed, but aneurysms frequently extend over more than one. The junctions of the parts are also common sites.

It is very uncommon for an aneurysm of the aorta to extend on to the great vessels. Hence, for example, when an aneurysm affecting the innominate artery is found, it is improbable that the thoracic aorta is involved.

An aneurysm in any position may be latent and give neither sign nor symptom until the final event occurs. Broadbent has pointed out that aneurysms of the ascending arch give early physical signs, and those of the transverse arch give early symptoms. Aneurysms of the descending arch and aorta are not uncommonly latent.

Aneurysms from the Sinuses of Valsalva.—These tend to grow downwards. They are frequently latent and pain is often absent. When signs and symptoms do exist they are usually indistinguishable from those of aortic disease. Aortic incompetence and cardiac hypertrophy exist with aneurysms in this position more commonly than with any other. Occasionally a diagnosis is made by the co-existence of such cardiac signs with œdema and venous stasis over the upper half of the body, due to pressure on the superior vena cava or right auricle. Death commonly occurs from rupture of the sac whilst small, usually into the pericardium.

From the Ascending Arch.—As a general principle, aneurysms tend to grow in the direction of the blood flow. Thus aneurysms of the ascending arch almost invariably arise from the convexity, and grow directly to the right when the origin is low down, or upwards and to the right, when it is higher. In this direction, the sac is extending away from the structures which are particularly responsive to pressure. Hence symptoms and signs of pressure are rarely present. Some aneurysmal pain is almost invariable, and, when the origin is immediately above the sinuses of Valsalva, angina and anginoid attacks are not infrequent.

The feature of these aneurysms is the frequency with which they erode the ribs. The patient may pay little attention to the pain, and not present himself until the ribs are perforated. In such a case there is an expansile pulsating tumour to the right of the sternum, with a systolic thrill and a diastolic shock,

a systolic murmur and a loud diastolic sound, and also an accentuated second sound at the aortic area. The heart may be dislocated to the left, and aortic incompetence and cardiac hypertrophy may be present. If the aneurysm is large, there may be signs of compression of a portion of the lung. With this there will be cough and slight hæmorrhage, but no laryngeal characteristics. Apart from these, respiratory signs are unusual.

When the sac is in contact with the chest wall but erosion has not commenced or is but slight, a dull area is found to the right of the sternum instead of the pulsating tumour. The thrill and shock may be communicated to the chest wall and the other physical signs be as already given. Inequality of the pulses may be present. The danger in ascribing any localising importance to this has already been referred to.

Œdema of the right arm may occur from obstruction of the right subclavian vein. Occasionally the superior vena cava is compressed. Inequality of the pupils is not common, and tracheal tugging and affection of the recurrent laryngeal nerve are very rare. Not more than one-third of these cases terminate by rupture, which is usually internal. Cardiac failure and intercurrent diseases account for the majority.

From the Transverse Arch.—These tend either to grow forward, eroding the sternum, and often appearing in the suprasternal notch, or to grow directly backwards. In either case, they cause early symptoms by pressure whilst the physical signs are frequently slight. Pain is usual, but angina is not related to these aneurysms. The results of pressure on the trachea and recurrent laryngeal nerve are shown both by the symptoms and the signs. In typical cases there is huskiness or weakness of the voice, metallic or “bovine” cough, and dyspnoea, often with inspiratory stridor. The last two are frequently paroxysmal. Dysphagia may be present. It is practically confined to aneurysms in this position. Slight hæmoptysis is frequent. The signs of pressure are especially tracheal tugging and left abductor paralysis. The latter may commence before the first symptoms. On examination of the larynx in the early stages of paresis, the left cord is seen to abduct sluggishly, and to lag behind its fellow. Other signs are inequality of the pupils and pulses and dilated veins, most

often seen above the second rib to the left of the sternum. Of physical signs, directly connected with the aneurysm, expansile pulsation in the suprasternal notch and dulness over the manubrium are the commonest, but, owing to conduction from the rest of the sternum, it is difficult to be certain of small areas of dulness in this position.

When erosion has occurred, an expansile pulsating tumour presents either centrally or to the left of the sternum. A systolic thrill and a systolic murmur may be present, sometimes being conducted into the great vessels, but the diastolic phenomena described with aneurysms of the ascending arch do not occur, except a diastolic murmur in rare cases. Tracheal tugging and abductor paralysis are specially important with aneurysms which arise from the junction of the transverse and descending parts. In this position other physical signs are usually absent, but hoarseness and respiratory symptoms due to compression of the left bronchus are extremely common.

Asphyxiation is the most common termination of aneurysms in the transverse arch, usually by direct compression of the trachea. Rupture is also frequent, and these two causes account for nearly all the cases. The end usually comes whilst the aneurysm is small.

From the Descending Arch.—These are much rarer than the preceding. They grow either to the left or backwards. In the former case, they may obstruct the subclavian artery and cause a small pulse, and may also compress the vein and cause venous congestion. In the latter case they may erode the ribs, and appear in the interscapular region on the left side, and, in addition, they may erode the vertebræ, and occasionally compress the cord. Many are latent, although they frequently attain to a large size. The pain may be deceptive. In addition to the local pain, due to erosion, there may also be referred pain felt in the abdomen above the umbilicus. The symptoms are most frequently the result of pressure on the left bronchus. In typical cases there are asthmatic attacks, without laryngeal characteristics, and with signs of deficient air-entry into the left lung. The sputum is often copious. A large sac may compress a considerable portion of lung tissue, causing cough and the signs of compression. Hæmoptysis is frequent.

The physical signs of the aneurysmal sac must be sought

for posteriorly on the left side. A widespread systolic murmur may be heard and a dull area be found on percussion. These signs are diminished, and may be absent in the erect position. When erosion has occurred pulsation may be felt, but expansion can be recognised only exceptionally. Inequality of the pulses may be present, but the pupils and the larynx are normal. Cardiac phenomena are not related to the aneurysm.

Rupture accounts for the great majority of cases. This is most commonly into the left pleura.

From the Descending Aorta.—These aneurysms tend to grow backwards and erode the ribs and vertebræ, and almost invariably they end by rupture. Although attaining to a very large size, they may cause no symptoms sufficient to attract attention. The aneurysmal pain is not felt down the arm, but is reflected over the lower thoracic areas, and consequently may be felt low down in the abdomen. Pain may also be due to erosion of bone or irritation of sensory trunks. Typical effects of spinal caries may be present when the vertebræ have been eroded, and the spinal cord and the nerve roots involved, abdominal pain and increased knee-jerks occurring early. The lung may be compressed by a large sac with the usual results. The physical signs of the aneurysm are similar to those described for the descending arch, but are situated lower, at the angle of the scapula. The larynx, pupils, and radial pulses are unaffected. The heart usually is uninfluenced, but, in very rare cases, is displaced to the right. Osler has called attention to the fact that when the sac is large the femoral pulse may be obliterated. The termination is by rupture in almost every case, usually into the left pleura.

VI.—DIAGNOSIS.

The diagnosis of aneurysm from other intrathoracic conditions is often perplexing. Scoliosis and deformities, with the resulting displacement of the heart and great vessels, may lead to deception in a manner which subsequently appears inexplicable in one's self and inexcusable in others. In pulsating pleurisy, the pulsation is extensive, but the force is slight. The history, general condition, and signs of sepsis are of assistance, and the particular symptoms and signs of aneurysm

are absent. The great trouble is to diagnose aneurysm from mediastinal tumours, the signs and symptoms resulting from pressure being very similar.

Mediastinal Tumours.—The most frequent are gummata, sarcomata, lymphadenomata, primary growths of the lung, and secondary deposits. Important points in the differential diagnosis in cases of difficulty are :—

(1) *Ætiology.* Age, sex, arterio-sclerosis, and history of syphilis and strain should be considered and valued, but it should be borne in mind that this is mainly *à priori* reasoning. The history of primary growths elsewhere is of importance.

(2) Cachexia is usually rapid with neoplasms. Patients with aneurysm are generally in good general condition.

(3) Irregular pyrexia is common with neoplasms. With aneurysms pyrexia is extremely rare.

(4) The advance of a neoplasm is more rapid than that of an aneurysm.

(5) Extrathoracic glands and primary and secondary tumours elsewhere must be looked for. The breasts, axillæ, supraclavicular fossæ, and the genital organs should be examined especially.

(6) Pressure effects are less marked with neoplasms than with aneurysms, with the exception of those connected with the venous system.

(7) With neoplasms, involvement of the recurrent laryngeal nerve is rare, and tracheal tugging very rare. Paralysis of the phrenic nerve, leading to immobility of the diaphragm on the affected side, is not uncommon especially in neoplasms of the lung. This never occurs with aneurysms.

(8) The sputum is scanty with neoplasms, except with primary growths of the lung, when it often has the "red currant jelly" appearance.

(9) Pleurisy is common with neoplasms.

(10) The dulness of a neoplasm tends to have an irregular outline and distribution.

(11) A neoplasm may appear externally and have transmitted pulsation. A distinct prominence is rare and the tumour need not be in the line of the aorta. It is not expansile, has no thrill, and no diastolic shock. A systolic

murmur may be present, but is rarely conducted along the vessels. There is no diastolic sound.

Gumma and aneurysm not infrequently co-exist. In this and any case where gumma is suspected, iodide of potassium is a powerful diagnostic instrument. In the general diagnosis of whether or no an aneurysm be present, Killian has recently been very successful with the aid of a bronchoscope. In all cases the X-rays should be employed. A radiograph is of great use for purposes of subsequent reference and comparison. For diagnosis the fluorescent screen is more satisfactory, since the patient can be examined when twisted into positions in which a radiograph cannot be taken. The pulsation of the aorta and the movements of the diaphragm also can be observed. The importance of this method of examination cannot be over-estimated, but it should be employed after and not before the physical examination.



PRACTICAL POINTS IN THE DIET OF THE
TUBERCULOUS PATIENT.

By SIDNEY H. HALL, M.B., C.M.,

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IF one were asked, as a practical physician, in what diseases nutrition is of most importance, all would, I think, place tuberculosis first, and couple with it syphilis, alcoholism, cancer, rickets, and the like. The incidence of phthisis on the poorly nourished, the anæmic, the intemperate, the diabetic, the pregnant woman, etc., all support the fact that, in incipient and threatening phthisis, the main line of treatment should be dietetic; but, up to now, the main, and if not the only, outcome of this has been the wholesale and indiscriminate prescription of cod-liver oil. Pamphlets, even books, have been written on the value of this solitary form of fatty food, and practitioners have been content for the most part to follow on well-trodden paths. I have been so frequently disappointed with this bare advice that I feel it a duty to record some of my experiences with this and certain other lines of treatment directed to the improvement of nutrition in the phthisical patient.

Without entering into physiological details, I have faithfully recorded improvements in weight, general physique, and progress of local conditions, preferring to be guided by those gross and readily observable facts rather than by fine calculations as to urinary and faecal contents, blood-counts, opsonic indices, and the like. I feel that most busy practitioners will be in accord with me in this.

I am in entire agreement with Dr. Dettweiler when he says, "*Ma cuisine, c'est ma pharmacie*," and I venture to assert that in no class of disease is this dictum of so much force as in the tuberculous variety. I have seen many true cases of what is termed "bacillary consumption" in which, after a

few months' careful dieting, the disease has become quiescent, and has remained so for many years; this in people living in their own homes, following their usual employment, and practically taking no drugs.

As regards the patients, on whom my observations have been carried out, they have almost all been out-patients of the poorer class. No selection of cases has been made, but all and sundry, young and old, have been tested as they came. Naturally, few people presented themselves in the incipient stages, the large majority being fairly advanced ones.

There are two classes of phthisical patients, in which this leading idea of giving fat is difficult to carry out—the so-called “pre-phthisis” class, and the patient with intestinal or peritoneal tubercle. Crude methods are obviously inapplicable here, and one must tempt with nourishing soups containing cream or milk, mince meat with a fair amount of fat incorporated, eggs mixed with warm milk in which a pat of butter has been dissolved, sweetbreads, bone-marrow, cocoa with milk, beef-tea with cream or milk added, buttermilk, plenty of butter or margarine, dripping, the liquid fat of bacon on toast, stewed eels, sheep's or calves' brains, goose breast, milk which has been boiled with minced suet, and particularly mutton fat, which I believe to be unusually well absorbed.

Meals must be slowly consumed, and a quarter of an hour's rest, at least, taken before all meals, this being much more important than the usual after-dinner nap. When once the dislike for fatty foods can be overcome, it frequently becomes changed into a real craving for fat—a delicate touch of nature cure which is of inestimable value to the phthisical.

Dr. Debove's system of “suralimentation,” or “gavage,” has not been successful in my hands, and I believe it to be physiologically incorrect; but, though I cannot say that I have ever been in favour of “forced feeding” methods for phthisical patients, I have found the greatest benefit from persuading them to disregard the old rule about always stopping when they feel they could eat a little more. In fact, I have always encouraged them to go on eating a little more, even though

they felt they had had as much as they wanted, and I have found that, after a few weeks of this, they have been able to consume more food, and this too with corresponding benefit. I almost think one could put forth as a dictum of more than average truth, that big eaters tend to become bigger eaters, and small eaters even smaller eaters. Of these two classes of people, there is probably no doubt that the latter will, generally speaking, be the healthier ; but, again, there is no doubt that, in the case of the phthisical patient, one must try to get him into one of the big eaters, for, if he falls into the other class, he will almost certainly shortly succumb to his disease. Therefore, as I have said, encourage him to go on a little more when he feels inclined to stop.

There is considerable difficulty in the administration of cod-liver oil in warm weather, particularly in the case of adults. I have never been able to discover the reason for this, and it seems at variance, to some extent, with the fact that natives of hot climates consume considerable amounts of oily food regularly. With children, cod-liver oil is, in my experience, always taken more readily, and with better results, than with adults. Indeed, I seldom order it with any confidence for adults, preferring to increase the fatty constituents of the diet with butter, bacon, cream, etc.

In the case of children under 2 or 3 years, I regard the use of cod-liver oil as practically useless. Between the ages of 5 and 15, the active growing period, it probably produces its best effects. I much prefer eucalyptus oil to creosote, as a means whereby to conceal its taste, and, in this form, I generally mix about one minim of eucalyptus to every two drachms of cod-liver oil.

In the matter of other fats, one has to consult the idiosyncrasy of one's patient, and probably also ring the changes on different varieties. Cream is much vaunted as a fat producer, but I find a condition which can best be described as "fat dyspepsia," produced more easily with this than with most other fats. Butter stands high in my estimation, and margarine next, and beef dripping next, in the list of well-borne fats. Devonshire cream and cream-cheeses are

better "fatteners" than ordinary cream.

In the case of the patient, who is both of the tuberculous and bilious diathesis, I firmly believe in the advice given by J. Milner Fothergill—that is, to give liberal supplies of food combined with the fairly free use of purgation.

I trust I shall not be regarded as old-fashioned if I pronounce a strong opinion as to the value of rum and milk for phthisical conditions. My experience is that, as a nourishing stimulant and fat producer, it far exceeds anything else I know. It is most useful when taken about half an hour before breakfast, and the next best time to take it is between breakfast and lunch. Jamaica rum, the older the better, is far preferable to the silent spirit preparations so plentiful on the market. About a tablespoonful of this with half a tumbler of milk, sweetened or not, according to taste, is one of the best appetisers for the phthisical patient. Patients who cannot take milk in any other form take it readily with a little rum; care must be taken that only a modicum of rum is taken with it—never more than two tablespoonfuls to a tumbler-full of milk.

It is well known that animal fats are more digestible and assimilable than vegetable fats, but, with the single exception of cod-liver oil, I do not know of any animal fat which the producers of proprietary medicines have ever attempted to place on the market in a tempting and palatable form.

An emulsion or cream of mutton or lamb fat would be an ideal fatty food for the phthisical patient, and for many others, and there should be no difficulty about producing it cheaply enough for the poor. The firmer the fat, *i.e.*, the more stearine it contains, the better it seems to build up the human constitution. The softer the fat the more short-lived its effect; the patient becomes more or less like one of those show babies fed on starchy and sugary foods, and has no real firmness about his flesh.

The phthisical dyspeptic cannot, as a rule, take the fat of ordinary beef-steak, and, in his case, it is wise to recommend him to put a lump of butter over it, and let this replace the natural fat of the beef. As regards salad oil, it has acquired

a name for indigestibility, but this is probably due to the uncooked vegetables with which it is generally eaten rather than to the oil itself. The same difficulty of digestion is not observable, in my experience, with cooked salads dressed with oil. If any partiality for salads is shown by the patient, it is well to have them cooked, and to have the oil emulsified with yolk of egg ; no trouble whatever will then be experienced in their digestion. In the case of children, home-made toffee, made with butter and sugar (or treacle), judiciously administered, is a very useful adjuvant to the dietary. For some little time, amongst my better-class patients, I used olive oil in emulsion form ; but this, though possessing the advantages of tastelessness and ready digestibility, did not produce the same lasting results in the way of fattening the patients as were obtainable in other ways.

In a few of the cases which I describe later the lung condition was complicated by peritoneal tuberculosis, and the prognosis was accordingly grave. The gastralgia and intermittent diarrhœa were aggravated by cod-liver oil, even when given in small doses and in elegant emulsion form. Cream, butter, dripping, and various other domestic fats, as they may be termed, certainly answered well for some time ; but an examination of the stools showed that even these were not well assimilated. Various petroleum emulsions yielded the same results, and confirmed my opinion that they are practically worthless in such conditions. With Sanatogen, a preparation containing glycono-phosphates, alluded to later, I had no brilliant results at first, some of the patients stating that it made them feel sick shortly afterwards. I then adopted the plan of having it added in small quantities to the milk, tea, cocoa, etc., they were taking, without their knowledge, and no further complaints were received. I am inclined to put the ill-effects named down to a purely psychical cause, it being a matter of every-day observation that phthisical patients are highly fastidious in matters of food and medicine. The amount of Sanatogen given was very gradually increased. After three weeks of this treatment, cod-liver oil was once more carefully commenced, and, except in one case, was well borne. The two remedies were concurrently administered for

some weeks, and with distinct benefit; both were taken well, and other articles of diet were at the same time more liberally administered, with good results.

Here, of course, one is doubtful to which line of treatment to award the palm. I am sufficiently convinced, however, of the value of Sanatogen as an *introduction* to the exhibition of the fatty foods in such conditions of squeamish digestion, to recommend it highly to those who value cod-liver-oil for the treatment of these and similar cases, but find a difficulty in its administration.

A few cases typical of the benefits derived from this particular food substance may be quoted:—

Case 1.—E. R., aged 32, female, married, three children. R. apex dull on percussion for about three square inches anteriorly and some moist rales present showing commencing softening. Weight on commencement of treatment 96 lbs. Was urged to diet liberally; did this under my advice for three weeks, at the end of which time weight had increased to 100 lbs. Weight remained almost stationary for three weeks, further oscillating between 99 and 101 lbs. Given linseed-oil emulsion, at the end of 18 days weight had gone up to 103 lbs. Appetite still fanciful and capacity for work feeble. Lung symptoms stationary, still an irritating cough, which hindered sound sleep. Sanatogen now given, two teaspoonfuls thrice daily, sometimes in water, sometimes in milk. Weight ran as follows:—

At commencement of Sanatogen treatment 103 lbs.

End of first 10 days	- 104½ "
" " 21 "	- 107 "
" " 28 "	- 108 "
" " 42 "	- 113 "
" " 60 "	- 116 "
" " 80 "	- 119 "

Patient's energy increased with weight, but Sanatogen was continued for close upon four months, being taken twice daily during the later periods. At the end of this time, the weight was 124 lbs., and remained at or about this for over six months. The lung condition was entirely cured, a slight dulness on percussion over an area of about a square inch alone remaining, and there being no signs whatever beyond this.

Case 2.—B. A., aged 3 years. Had been artificially fed on milk and water, with cream added occasionally, for over seven months, and then had passed gradually on to the ordinary child's diet. Had been a weakling since birth. Came under my care for chronic, almost intractable, diarrhœa and wasting. Abdominal examination revealed a fair amount of distension and great tenderness on pressure over the cæcum. The stools had averaged about four per diem, and had more than once contained blood. Weight was 29 lbs. Bismuth and Dover's powders held the diarrhœa a little in

check. Routine treatment with cod-liver oil, maltine, various phosphatic preparations, and so on, proved utterly useless. At the end of another fortnight, the weight had dropped to 27 lbs., and the child was a feeble wreck. Inunctions of cod-liver oil, olive-oil, and occasionally oleate of mercury appeared to do some good, but hardly any food seemed to be digested. Sanatogen was given in very small amounts in water. From the first it was retained, and after a few days the diarrhœa ceased. Sanatogen was increased up to two teaspoonfuls twice daily, always in water and sweetened slightly. Weight increased rapidly, abdominal distension gradually decreased, tenderness vanished, and the general strength and ability to digest ordinary children's food increased. An attempt to administer cod-liver-oil emulsion was once made, but it caused a return of the diarrhœa, and was immediately stopped. At the end of three and a half months the child was practically cured; weight was now 39 lbs., an increase of 12 lbs. in three months, or an average of 1 lb. per week. Seen six months later, this child was as well as a child could be.

Case 3.—G. I., aged 54, male, bricklayer's labourer. Pulmonary and intestinal tuberculosis, cavity in left apex, profuse diarrhœa, five to seven evacuations daily. Height, 5 ft. 6 in.; weight, 122 lbs. Greatly emaciated and enfeebled. Considerable cough, and muco-purulent expectoration loaded with tubercle bacilli. Appetite capricious. Had been a considerable beer-drinker, and had lately been taking brandy to "keep him up." Admitted as an in-patient. Feeding proved the greatest difficulty, the least venture beyond the blandest articles inducing further diarrhœa. With Sanatogen, which was then commenced, the treatment was continued for nine weeks more, and the patient had then virtually conquered his disease. Cough and expectoration had become very slight, stools were normal, appetite literally huge, digestion perfect, fever gone, sleep excellent, and weight now 144 lbs. He was drafted off to a convalescent home at the seaside, and was eventually taken on there after a month's residence as an assistant gardener, which post he still holds.

These cases could be multiplied, but repetition becomes tedious. I therefore submit a tabulated statement of other cases, classified as well as such cases can be arranged.

These were cases taken indiscriminately as they presented themselves. A glance at the columns, showing length of treatment and gain in weight, will be enough to convince even a casual observer that the gain under Sanatogen treatment was distinctly greater than under the routine dosage by cod-liver oil. The column recording the final result is one which has, necessarily, had to be somewhat baldly worded, but it was based upon careful clinical, and in many cases bacteriological, examination. Similar remarks apply to the table relating to intestinal tuberculosis: most of these cases were, as will be seen, those of young children.

PULMONARY PHTHISIS (SANATOGEN TREATMENT).

Stage of Disease.	Tub. Bac. in Sputum.	Height in Inches.	Duration of Sanatogen Treatment (days).	Weight at Start (lbs.).	Weight at End (lbs.).	Increase in lbs.	Final Result.	Remarks.
1. Consolidation.	Yes	64	38	118	132	14	Cure.	
2. " "	Yes	61	70	99	107	8	"	
3. Apical softening.	Yes	66	84	130	146	16	Greatly improved.	Olive oil also given 14 days.
4. " "	Yes	67 $\frac{1}{2}$	90	132	142	10	"	
5. " "	Yes	65	74	129	140	11	"	
6. Excavation	Yes	65	88	126	140	14	"	Intestinal tubercle also.
7. " "	Yes	67	44	134	138	4	Death.	Pneumothorax.
8. Fibroid -	Yes	68	62	141	156	15	Cure.	
9. " -	Yes	60	54	116	120 $\frac{1}{2}$	4 $\frac{1}{2}$	"	
10. Consolidation.	?	62	44	109	112 $\frac{1}{2}$	3 $\frac{1}{2}$	Very great improvement.	Intestinal tubercle also.
11. " "	Yes	66	72	133	141	8	Cure.	
12. " "	Yes	69	56	153	158	5	Much improved.	Pancreatic emulsion also given, 14 days.
13. Softening -	Yes	73	35	170	173	3	"	Left for Sanatorium.
14. Excavation	Yes	65	70	118	122 $\frac{1}{2}$	4 $\frac{1}{2}$	"	Intestinal tubercle.
15. Consolidation.	?	70	52	159	162 $\frac{1}{2}$	3 $\frac{1}{2}$	Cure.	Iodoform given for 4 days. Intestinal tubercle also.
16. " "	Yes	67	28	136	138 $\frac{1}{2}$	2 $\frac{1}{2}$	Much improved.	
17. " "	Yes	72	92	168	186	18	Cure?	
18. Excavation	Yes	69	72	156	162	6	Almost cured.	Guiacol also given, 10 days.
19. " "	Yes	66	30	138	140	2	—	Intestinal tubercle, also profuse diarrhoea—death.
20. Fibroid -	Yes	73	42	181	184 $\frac{1}{2}$	3 $\frac{1}{2}$	"	
21. Softening -	No	61	60	102	109	7	"	Larynx also affected.
22. " -	Yes	67	88	129	139	10	Cure?	

PULMONARY PHTHISIS (COD-LIVER OIL TREATMENT).

1. Consolidation.	Yes	66	about 150	138	142	4	Cure.	
2. " "	Yes	72	80	169	172 $\frac{1}{2}$	3 $\frac{1}{2}$	Slightly improved.	
3. " "	Yes	69	66	159	161	2	Very little improvement.	

Stage of Disease.	Tub. Bac. Sputum.	Height in Inches.	Duration of Sanatogen Treatment (days).	Weight at Start (lbs.).	Weight at End (lbs.).	Increase in (lbs.).	Final Result.	Remarks.
4. Softening -	Yes	67	92	141	137	4	Much worse.	Strumous glands, neck.
5. Cavity -	Yes	64	44	129	129	0	Worse.	
6. " -	Yes	64	80	134	137	3	Improved.	
7. " -	?	69	96	158	163	5	"	
8. Consolidation.	Yes	70	63	156	159	3	Some improvement.	Iodoform given also for 14 days.
9. Fibroid -	Yes	67	120	139	146	7	Much improved.	
10. " -	Yes	67	112	142	146	4	Fair improvement.	
11. Consolidation.	Yes	66	80	137	139	2	No improvement.	
12. " (Early)	?	63	90	119	122	3	"	

INTESTINAL TUBERCULOSIS (SANATOGEN TREATMENT).

Character of Illness.	Age.	Height in Inches.	Duration of Treatment.	Weight at Commencement (lbs.).	Weight at End (lbs.).	Total Gain.	Final Result	Remarks.
1. Tabes mesenterica.	7	44	48	44	48	4	Cure	Neck glands, tuberculosis.
2. " "	11	51	66	62	70	8	"	Neck glands, tuberculosis. Mercurine ointment also used.
3. " "	14	57	70	83	90	7	"	
4. " "	9	46	49	52	55½	3½	Almost cured.	
5. " "	16	59	60	106	119	13	Splendid cure.	
6. " "	14	57	60	87	91½	4½	Cure.	Hip disease also. Mercurine ointment also used. Lungs also affected.
7. " "	13	57	56	74	78	4	"	
8. Peritoneal -	10	52	70	56	60	4	Improvement.	
9. " -	11	54	32	63	64½	1½	Slight improvement.	
10. Tabes -	10	52	49	60	63	3	Improved.	Mercurine ointment also used.
11. Peritoneal -	9	48½	28	55	57½	2½	"	
12. " -	15	60	35	100½	105	4½	Much improved.	
13. " -	13	53	66	80	86	6	Cure.	
14. Tabes -	8	44	51	46	51	5	"	

INTESTINAL TUBERCULOSIS (COD-LIVER OIL TREATMENT).

Character of Illness.	Age.	Height in Inches.	Duration of Treatment.	Weight at Commencement (lbs.).	Weight at End (lbs.).	Total Gain.	Final Result.	Remarks.
1. Tabes -	10	53	90	58	63	5	Cure.	Strumous glands also cured.
2. Peritoneal -	8	45	60	49	52	3	Improved.	
3. " -	11	54½	95	68	73	5	"	Mercurine ointment also used.
4. " -	7	45	42	48	50	2	Little change.	" "
5. " -	6	43	63	41	44	3	Almost cured.	" "
6. Tabes -	9	48	42	56½	56	-0½	No change.	" "
7. " -	12	56	70	74	76	2	Very slight improvement.	
8. " -	11	53	70	66	67	1	"	
9. Peritoneal -	12	53	84	77	81½	4½	Cure.	Mercurine ointment also used.
10. " -	9	47	50	54	56	2	Some improvement.	" "
11. Tabes -	8	45	50	49	50	1	"	

Some people think that nutrition is merely a matter of food and drink, but I go further. Nutrition is something more than a mere mechanical addition of oxygen, hydrogen, nitrogen, and the like, to the cells of the body. It is not the simple feeding of a furnace with fuel. Nutrition is a vital process, depending on the functional activity of the cell, and, I believe that, just as by the administration of strychnine, we can stimulate the strength and alertness of the nervous cell, so, by appropriate drugs, if we care to call them so, we can rouse the energy of the metabolic action of the cells concerned in assimilation and nutrition generally. I believe that the glycerophosphates, such as are contained in Sanatogen, possess this power of stimulating metabolic activity, for on no other grounds can one properly explain the literally wonderful and beneficial effect on nutrition obtained by the administration of comparatively small doses of this food-drug, as it may fairly be called.

Of drugs proper, which appear to also favour nutritional

changes, I am distinctly inclined to iodoform, grs. $1\frac{1}{2}$ or 2 given twice daily, with a very small addition of codeia to obviate unpleasant after-effects as advocated by Ransome. After the use of iodoform, there is almost always an improvement in appetite, an increase in weight, and a lessening of the cough.

Comparing glycerophosphates and iodoform, as to the *rationale* of their action in influencing the nutrition of the phthisical patient, it appears to me that the glycerophosphates exert a beneficial effect on nutrition irrespective altogether of the pathology of the disease, whilst iodoform acts rather by inhibiting the multiplication of the pathogenic bacteria and neutralising their toxins, thereby preventing the wasting of tissue which would otherwise be produced by those toxins. On this account, I prefer to limit the use of iodoform to the more advanced cases of phthisis, and those cases in which the intestines and their glands are involved.

There is, I feel convinced, a great future for that class of substance which is both food and drug, and particularly for articles containing easily assimilable cell-essentials, such as nitrogen and phosphorus. The market already contains many of them, and, like everyone else I suppose, I have given most of these a careful trial. The one I have been heretic enough to mention, Sanatogen, so far easily holds the field against any that I have ever tried.

I trust the record of these investigations, and the opinions I have expressed will lead to a better appreciation of the value of a carefully regulated diet in the case of the phthisical patient.



ADVANCES IN CLINICAL PATHOLOGY.

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ONE of the great desiderata of the practitioner, whether physician or surgeon, is a conclusive method for the diagnosis of syphilis, especially perhaps in the early and later latent stages.

The discovery of the spirochæte or treponema of syphilis raised great hopes that a new and most valuable diagnostic agent would be at our disposal, and, in many instances, this is the case. But the recognition of the spirochæte is by no means easy, and the organism is often present in very scanty numbers. In many cases, too, no material is forthcoming for an examination, unless a skin-lesion is excised, and, even then, the tissue has to be passed through a lengthy method of staining (Levaditi's), and one, moreover, which is not always successful. In these circumstances, renewed attention has been attracted to the possibility of a specific blood-test being devised, and Wassermann has invented a modification of the Bordet-Gengou reaction (absorption of complement), which has attracted much attention, and has led to a close scrutiny of some of our ideas with regard to the nature of some of the reactions which are supposed to be due to the action of antibodies.

In ordinary circumstances, the two substances which take part in bacteriolysis (immune body or amboceptor, and complement or alexin) are supposed to remain free side by side in the fluid which contains them. Thus, in the blood of a person who has recently suffered from typhoid fever, there is a typhoid immune body and various forms of complement, and these have no tendency to unite together. If, however, typhoid bacilli are added, the immune body unites with the organisms, and all the complement unites with the compound thus formed—though whether with the immune body, as Ehrlich thinks, or with the bacillus itself, on Bordet's theory,

is not satisfactorily settled. The important thing to notice is that the combination of the two substances has the effect of ridding the fluid of *all* the molecules of complement, whether these are of use in dissolving the bacillus or not. Now it is very easy to test for the presence or absence of complement in a fluid. If the red blood corpuscles of one species of animal (*e.g.*, a pigeon) are injected into another species (*e.g.*, a rabbit), the serum of the latter will develop an immune body to the corpuscles of the former. If pigeon's corpuscles are mixed with the serum of a rabbit thus prepared, and incubated, they will be dissolved ; this is due to the fact that this serum contains both the necessary immune body and complement. If, however, the rabbit's serum is first heated, the corpuscles will be apparently unaltered ; this is owing to the fact that the complement has been destroyed by the heat. Yet corpuscles, which have been exposed to the action of this heated immune serum, have been altered (sensitised) in some way, as is shown by the fact that if fresh normal serum (from a rabbit or guinea-pig) is added, they are rapidly dissolved. Thus corpuscles sensitised in this way may be used as a test for complement ; if they are added to a fluid containing this substance they will become dissolved, whilst if the fluid contains none they will be unaltered.

To take a simple case : suppose we take some blood from a typhoid patient (containing immune body) and heat it, so as to destroy the complement, and then add some typhoid bacilli or an extract from them ; the two will combine and a substance avid for complement will be formed. To test this, a little fresh guinea-pig serum (which contains complement) is added, and the mixture incubated, to allow of total absorption. Finally, pigeon's corpuscles sensitised by the action of heated serum of a rabbit which has been injected with pigeon's blood, is added, the whole mixture incubated, and the result noted. If the corpuscles settle down, leaving the fluid colourless, it shows that all the complement had been withdrawn in combination with the bacilli, and therefore that there was actually a typhoid immune body in the serum being tested. If the corpuscles are dissolved, so that a pink fluid is produced, the complement had not been withdrawn, and there was no typhoid immune body in the serum. This test appears to be a general one, and might very well be used for the diagnosis of

typhoid fever, if the Widal's test were not more simple and equally satisfactory. It has been used with success in the diagnosis of gonorrhœal rheumatism and other affections, in which no material in which the specific organism could be demonstrated, was forthcoming. The process is just the same as the above, except that a culture of gonococci would replace the typhoid bacilli. It is, of course, merely a test for the presence or absence of an antibody to the organism causing the disease suspected: such antibodies are not invariably formed (they are often absent in tubercle), but they usually occur, and their absence is strong evidence against the diagnosis.

The difficulty in the way of applying this reaction in the case of syphilis arose from the fact that the organism was not known, and no culture could be obtained. The discovery of the spirochæte, and of the fact (as shown by Levaditi's method of staining) that macerated syphilitic fetuses contained the organisms in vast quantities in the liver and other internal organs, suggested a solution of the problem, and an extract of these organs was used in exactly the same way as the typhoid culture in the example given above. This is the Wassermann-Neisser-Bruck reaction, and in general outline the technique is as follows:—The antigen (*i.e.*, the substance which combines with, or gives rise to the formation of, the antibody) was prepared by drying the foetal organs in a dessicator. They were then powdered, and in this form would keep indefinitely. For use in the test, a little of the powder was thoroughly mixed with normal saline solution and filtered. The patient's serum is inactivated by heat (56°) and diluted (to an extent determined by preliminary tests with the extract in question and known syphilitic serum), and a mixture of this diluted serum and the solution of the antigen made, *e.g.*, 1 c.c. of a twenty or forty-fold dilution of the serum and $\cdot 1$ or $\cdot 2$ of the organ-extract. To this mixture a little fresh guinea-pig serum (containing complement) is added. The whole is incubated for half an hour or an hour. Lastly, the red corpuscles and heated immune serum are added: the corpuscles may be those of a sheep, and the serum that of a rabbit which has been injected with the corpuscles in question. The whole complex mixture

is incubated for two hours (it is best to stir or shake once or twice) and then kept some hours in the ice-chest, and the result noticed. If there is no hæmolysis, it was supposed to indicate that the serum contained an antibody, that this combined with the spirochætes or substances dissolved from them, and that this had absorbed all the complement, so that none was left to dissolve the sensitised corpuscles. If hæmolysis occurred, there was no antibody, and a diagnosis of syphilis was held to be unlikely.

Several controls are necessary, *e.g.*, a tube in which the ingredients are the same as above, but without the guinea-pig's. This should show no hæmolysis. Further, quantitative tests may be performed, in which various dilutions of serum are used, in order to determine the minimal amount which will just hinder hæmolysis, the other conditions being constant; in this way a rough idea as to the amount of the supposed syphilitic antibody can be determined.

The solution of a sensitised red-blood corpuscle is not the only test for the presence of complement which is available. It is now practically certain that this substance and thermolabile opsonin are identical, and, at a meeting of the Pathological Section of the Royal Society of Medicine (December 8, 1908), Ledingham announced that the mixture of organ extract and syphilitic serum would lead to the removal of all opsonising properties from fresh guinea-pig's serum. This has also been discovered by Hartoch (*Petersburg Med. Woch.*, December 20, 1908), the technique being similar to that used by Ledingham. A mixture of organ extract, heated and diluted syphilitic serum, and fresh guinea-pig serum is incubated 1-1½ hours, and is then used instead of serum in an opsonin determination, staphylococci being used as the organism, and guinea-pig leucocytes as the phagocytting cells.

Further research brought a new and very remarkable fact to light, and has caused us to alter our views as to the interpretation of the processes by which the reaction is produced. It was shown by Landsteiner, Müller, and Pötzl that alcoholic extracts of *normal* organs, *e.g.*, of the heart-muscle of the guinea-pig, or even of the lipoid substances isolated therefrom, might be used instead of the material containing spirochætes. The reaction, therefore, must no longer be regarded as a purely

specific one in the sense in which the term is generally used. Its exact nature must be a subject of future research, and, in the meantime, we must be content by saying that the serum of syphilitic patients contains a substance which has a remarkable affinity for certain lipoid substances occurring in normal and diseased organs, and that the combination of the two will attract complement to itself. The specificity of the reaction is called in question, and can only be determined by extended clinical experience. Some of the chief results will be briefly summarised.

It may be stated, in general, that the reaction is almost always absent in health, and is rarely present in diseases other than syphilis. In 1,010 cases Wassermann did not get a single positive result, but soon after this other observers began to find positive results in various diseased conditions, especially in diseases which, like syphilis, are due to protozoa (malaria, trypanosomiasis). It may occur also in scarlet-fever (Eichelberg) and in leprosy. In other diseases it is comparatively rare, though it does occur: thus Bruck and Stern met with it twice in 157 non-syphilitic cases, and Gross and Volk also twice in 68. Other observers have found it more frequently. Elias and others found it five times in 25 cases of phthisis, Weil and Braun four times in 12 cases of pneumonia, etc. It must at once be admitted that the presence of a reaction cannot in itself constitute any proof of syphilis, but, at the same time, it is rare in health or in other conditions. Nor is it always met with in syphilis: it occurs in some 90 per cent. of all cases, including those of latent syphilis and "meta-syphilitic" affections. Thus Butler, in primary cases, found it present in all of four cases; in secondary cases, 24 out of 25; in tertiary, 16 out of 17; and in latent cases, 8 out of 15.

The matter has recently entered on a fresh stage by the discovery by Ballner and Decastello (*Deut. Med. Woch.*, November 5, 1908) of the fact that there is a decided difference between the reaction, as seen in syphilitic blood, and the false reaction occurring in other diseases. They used ox corpuscles and obtained their hæmolytic serum from rabbits, and found that in syphilis, if no addition of organ extract be made, there will be no absorption of complement and consequent interference with hæmolysis. In the false reactions the absorp-

tion of complement took place *without* the addition of the extract of organs, and is, therefore, termed *autotropic*. This is apparently far more specific. In five cases of undoubted syphilis, secondary, tertiary, and latent, there was no case in which hæmolysis was absent when no organ extract was added; in two, there was a trace of inhibition, as compared with the controls. They did, however, meet with one case of myeloid leucocythæmia, in which syphilis was denied, but which gave a true reaction. Seventeen "autotropic" sera were met with; these came from cases of carcinoma, tubercle, alcoholism, etc. These results are most promising, and further research may show that that will provide a method by which a certain diagnosis may be obtained, even when the disease is latent.

Numerous researches have been made with regard to the presence or absence of the reaction in the cerebro-spinal fluid of healthy persons, tabetics, general paralytics, etc. It is found that the fluid of the latter is most active in this respect. Marie, Levaditi and Yamanouchi found it in 28 cases out of 30 (93 per cent.), and others have found it still more frequently; but in general it is present in 80 to 90 per cent. of all cases, and, what is even more interesting, it may be present in this situation when it is absent from the blood: in Marie's series it only occurred in the serum in 59 per cent. of all cases. It is less frequent in tabes, and is extremely rare, if it ever occurs, in non-syphilitic affections. In over 50 examinations, including diseases of the most diverse nature (glioma, Jacksonian epilepsy, etc.) Kroner did not meet with it once in diseases other than syphilis. It occurs in scarlet fever, but, apart from this, is apparently much more nearly specific when occurring in the cerebro-spinal fluid than in the blood.

We have already mentioned that the substances which prevent hæmolysis are of fatty nature, and a few further details may be mentioned. It was shown by Landsteiner, Müller and Pötzl, and also independently by Levaditi and Yamanouchi, that the active material is soluble in hot alcohol; the latter authors showed that this extract contains both bile salts and lipoid substances, and that the Wassermann reaction can be obtained by using taurocholate of soda, glycocholate of soda, or lecithin: these, of course, cannot be antigens like those with which we have been previously familiar.

Porges has attempted to demonstrate the presence in the sera of syphilitics which have the power of uniting with and precipitating emulsions of lecithin in the following manner. The emulsion is prepared by shaking up 1 gram of lecithin in 100 c.c. of a 0·5 per cent. solution of carbolic acid in normal saline solution. The test is carried out by mixing equal volumes of serum and this emulsion; Porges uses ·2 c.c. of each. The mixture is incubated for 5 hours and then kept for 20 hours at the room temperature. Normal sera cause no alteration, whilst those from syphilitic patients are said to cause a precipitation of the lecithin. This method has not attracted that amount of attention which its simplicity would seem to deserve, but Nobl and Arzt obtained 81 per cent. of successes in syphilitic cases, and only obtained a single positive reaction in control experiments. Other investigators have been less successful, and according to Elias Neubauer, Porges, and Salmon these results have been partly due to the varying composition of the specimens of lecithin sold. They now recommend a freshly prepared 1 per cent. solution of Merck's glycocholate of soda in distilled water in place of the lecithin.

A method of quite different nature has been introduced by Fornet, Schereschewsky, Eisenzimmer, and Rosenfeld. According to them the serum of patients in the early stages of syphilis contains a precipitogen, whilst that of patients suffering from tabes or general paralysis contains a precipitive: when the two sera are brought together, the one being floated on the other, they form a characteristic ring at the area of contact. In a later communication, two of these authors affirm that normal serum may, as a rarity, contain the precipitive, but never the precipitogen.

Lastly, Klausner, being led to the belief that Wassermann's reaction is due in some way to an increased globulin-content of the serum of syphilitics, devised a simple method by which the presence of an increased amount of these substances could be tested by simple means. He finds that if ·2 c.c. of normal serum be added to ·7 c.c. of distilled water no precipitate is formed after an interval of 24 hours or less. If, however, the serum is from a syphilitic patient, a precipitate, some 2-4 millimetres, will be formed in about 15 hours. Klausner admits

that the reaction is not sharply specific, since he obtained it in cases of lupus, typhoid fever, etc., but it is not invariably present in these affections. He found it constantly in 31 cases of syphilis. In a later communication, he used only .6 c.c. of water to .2 c.c. of fresh serum, and got somewhat better results.

It will be seen, from this outline of the present state of the subject, that there is no lack of suggested methods ; the great desideratum is a careful, independent clinical study of each. At present Wassermann's reaction appears to be the only one likely to be of much clinical value, and it is possible that one of its modifications will enable us to diagnose the disease with some degree of certainty.



THE VALUE OF MOUTH-WASHES.

By STANLEY PARKES MUMMERY, M.R.C.S., L.R.C.P., L.D.S.

The purposes for which mouth-washes are commonly used may roughly be divided into two classes,

1. As a remedial measure,
2. As a prophylactic measure.

As a remedial measure, mouth-washes, containing one or more medicinal agents, are usually prescribed for many morbid conditions of the mouth, tongue, and upper pharynx. I propose, however, to deal with the second chief use of mouth-washes, viz.—their employment as a prophylactic measure against disease.

That the value of bactericidal mouth-washes in prophylaxis has not gained more general recognition is largely attributable to the insufficient study that has been bestowed upon this important question. The scientific composition of efficacious bactericidal washes has received but scant attention from medical men, and the usual form of antiseptic wash is as hopelessly inefficient as it is unscientific.

It is well known that the mouth is the portal, whereby the organisms of many diseases gain entry to the body, but it is perhaps not so widely realised that the mouth may also act as an incubation chamber for the growth of such organisms as gain admission:—Let us imagine, for instance, the entry of certain organisms with the food. If passed straight on into the stomach, their numbers may be so small as to be easily dealt with by the gastric secretions. The immediate passage of such bacteria into the stomach is, however, by no means always the case. In many mouths, large masses of soft food are retained between the teeth, owing to irregularities, or mutilation by dental caries. Any organisms, which reach these positions with the food, find themselves in a natural incubation chamber of no mean capabilities. They are kept at blood heat, in a moist atmosphere, and with a plentiful supply of nutrient material.

In such circumstances, they may multiply with great

rapidity, and, when the mass of food containing them finally gets dislodged from its position and passes down into the stomach, the culture of pathogenic bacteria, which it carries with it, may be too large to be destroyed by the gastric secretions, and, passing on into the bowel, may set up serious or fatal disease.

Now it has been proved, by the careful experiments of Professor W. D. Miller of Berlin, that the oral secretions possess no bactericidal properties whatever, and that we must not look to the saliva for protection against any organisms that gain admission to the mouth. A certain antagonism to the growth of extraneous organisms does, however, exist in the mouth, as was proved by the complete disappearance, in a few hours, of all traces of large cultures of *Bacillus prodigiosus*, which were introduced into the mouth experimentally. Professor Miller showed that this disappearance was attributable to the struggle for existence which takes place between the newly introduced organisms and the natural flora of the mouth.

This so-called natural flora of the mouth consists of a certain number of micro-organisms which are habitually present in all healthy mouths. The following list includes those found in all mouths:—

1. *Leptothrix innominata*.
2. *Bacillus buccalis maximus*.
3. *Leptothrix buccalis maxima*.
4. *Jodococcus vaginatus*.
5. *Spirillum sputigenum*.
6. *Spirochæte dentium*.
7. *Leptothrix racemosa*.

Under the best conditions, therefore, the mouth is very far from being a sterile cavity.

The organisms, included in this list, have by adaptation to their surroundings, become very firmly established in the mouth, so that in competition with less perfectly adapted organisms, which may gain admission, the latter are invariably crowded out, and fail in the struggle for existence.

It is, however, important to realise that this nice adjustment of the micro-organisms of the mouth only obtains under normal conditions, that is in perfectly healthy mouths. When

unhealthy conditions of the mucous membranes are present, as they are in about 80 per cent. of modern mouths, the balance of these normal mouth organisms is destroyed, and their protective action is therefore largely removed. In some cases even, the normal mouth bacteria, usually so harmless, may take on pathogenic qualities, as in those cases, in which *spirochæte dentium* is responsible for a chronic gingivitis. I have obtained a pure culture of the latter organism from the pus round the necks of the teeth in one such case.

A large variety of pathogenic bacteria is to be found in the mouth by repeated examinations, indeed there are very few bacteria that have not been described, at some time or other, as occurring in the salivary secretions. The majority of these are ever only occasional visitors, and the pathogenic varieties that appear, with any degree of constancy, are but few in number. The pneumococcus is probably the most generally present, and occurs in a large proportion of all mouths examined. The Klebs-Löffler bacillus is also far more common in the mouth than is generally supposed, appearing in 33 per cent. of all persons exposed to infection (Goadby). Other organisms not infrequently found are: bacillus tuberculosis, staphylococcus aureus, and, more rarely, streptococcus pyogenes, bacillus coli, bacillus pyocyaneus, micrococcus tetragenous, streptococcus actinomyces, bacillus typhosus. Among this formidable collection, the first-named are, as already stated, very commonly found, and, when septic conditions of the mouth are present, a much larger proportion of micro-organisms appear. Such bacteria appear to exist in the mouth in a state of restrained virulence, ready at any time to take advantage of a temporary lowering of tissue resistance, and start into active and often fatal virulence.

The nutrient supply for these organisms is provided by mucous secretions, dead epithelial cells, and, in most mouths, food débris. Where gingivitis, or any other septic condition prevails, a further pabulum is afforded by the septic discharges, and even by the inflamed tissues themselves. It is probable that a healthy mouth allows the passage of very few pathogenic germs down the gullet, and then only in small numbers, owing to the competitive action of the normal mouth bacteria, as already described. If all mouths were healthy, therefore,

there would be little need for guarding against such infection of the system. It is important to bear in mind that, amongst civilised races, the vast majority of mouths are septic, in a more or less pronounced degree, and that the mouth of the average individual, instead of affording protection against disease, is rather an added source of danger. Here then is the value of a bactericidal mouth-wash as a prophylactic measure against disease, and the thorough sterilisation of the mouth, morning and evening, must afford considerable protection.

Very many antiseptics are used for purposes of mouth sterilisation, but a large number of these are rendered of little value owing to the fact that, if used in sufficient strength to sterilise the mouth within a reasonable time, they are either too caustic, as carbolic acid, or poisonous, as perchloride of mercury. The scientific composition of mouth-washes hence becomes of the utmost importance.

The following table of the relative values of the different antiseptics is taken from Professor W. D. Miller's book, *Micro-organisms of the Human Mouth*, and is the result of careful and elaborate experiments extending over several years. The degree of concentration given in the table is one which can be used with safety and comfort in the mouth. The time necessary for devitalisation refers to the time taken by each antiseptic in the degree of concentration given, to completely devitalise a growth of a ferment bacterium from the mouth grown in pure culture in the laboratory.

Antiseptic.	Concentration.	Time necessary for devitalisation.
Salicylic acid - - -	1 : 200	$\frac{1}{2}$ minute.
Benzoic acid - - -	1 : 200	1 to 2 minutes.
Borobenzoic acid - - -	1 : 175	1 " 2 "
Thymol - - -	1 : 1,500	2 " 4 "
Bichloride of mercury -	1 : 5,000	2 " 5 "
Carbolic acid - - -	1 : 100	10 " 15 "
Oil of peppermint - -	In agreeable strength.	5 " 10 "
Potassium permanganate -	1 : 4,000	More than 15 minutes.
Boric acid - - -	1 : 50	" " "

The comparative uselessness of carbolic acid, as an oral germicide, is evident from this table, since no one will consent to hold a wash in the mouth for ten or fifteen minutes at a time: yet carbolic is probably more often prescribed as a mouth-wash than any other antiseptic. On the other hand, the value of Salicylic and Benzoic acids is clearly brought out, the preference being given to the latter (benzoic acid) in spite of its slightly less powerful germicidal qualities, owing to the more beneficent action which it exercises on the mucous tissues. To quote the words of Professor Miller, "As a mouth-wash, we need above all a solution which acts *quickly*, and which does not simply prevent the development of micro-organisms while it is acting, but which devitalises them. There are agents, which even in very dilute form, if applied constantly, have a powerful antiseptic action, inasmuch as they prevent the development of such micro-organisms as may be present, without devitalising them. Such agents are of no more value in the treatment of the oral cavity than an equal amount of distilled water. It is seldom that anyone, in rinsing his mouth, will retain the wash longer than one minute, and an antiseptic mouth-wash to be efficient, should be able to devitalise the micro-organisms with which it comes in contact within this short time."

Professor Miller found that the following combination of the agents, given in the table above, accomplishes this for all, or nearly all, micro-organisms in the vegetative form. A solution which devitalises spores in one minute is out of the question, and in fact is not at all necessary, since the conditions, which lead to the formation of spores, do not exist in the mouth, where we almost exclusively find the vegetative forms.

Saccharini	-	-	-	-	gr. x.
Acid Benzoic	-	-	-	-	gr. xiv.
Tinct. Krameriaë	-	-	-	-	ʒi.
Ol. Menth. Pip.	-	-	-	-	ʒii.
Ol. Cinnam.	-	-	-	-	ʒii.
Alcohol Absol.	-	-	-	-	ʒi.

One part of this wash to nine parts of water, held in the mouth for one minute, will effectively sterilise the oral cavity. The saccharin was found to considerably add to the value of

the wash.

A simple form of the wash is as follows :—

Acid Benzoic	-	-	-	-	gr. xviii.
Tinct. Eucalypti	-	-	-	-	ʒiss.
Alcohol Absol.	-	-	-	-	ʒx.
Ol. Menth. Pip.	-	-	-	-	ʒiv.

A teaspoonful to half a glass of water.

A very excellent mouth-wash for chronic septic gingivitis, such as occurs in pyorrhœa alveolaris, can be composed with the addition of salicylic acid, and thus :—

Acid Salicylic,					
Acid Benzoic	-	-	-	-	āā gr. xvi.
Tinct. Krameriæ	-	-	-	-	ʒiss.
Alcohol Absol.	-	-	-	-	ʒi.

A teaspoonful to a small wineglass full of water.

The salicylic acid, besides being a powerful germicide, has a caustic action upon the gums, and this, together with the astringent effect of the Rhatany, makes the wash a useful one for such cases.

As a local prophylactic measure against dental caries, bactericidal mouth-washes have also a large sphere of usefulness. When, however, deep retaining centres for food exist in and between the teeth, the complete sterilisation of such places is not possible by means of mouth-washes alone. The food must first be removed by means of the toothbrush, thus enabling the wash to flow into such positions, and effect their proper sterilisation. Used in this way, in conjunction with the toothbrush, antiseptic washes are of decided value as a preventive against dental caries.



"CHLOROFORM ANÆSTHESIA."

SOME UNAPPRECIATED "VIRTUES" OF CHLOROFORM AND
"VICES" OF ETHER.

By R. ERNEST HUMPHRY, M.R.C.S., L.R.C.P.

ALTHOUGH in Scotland and the North of England the anæsthetic of choice is invariably chloroform, yet in the South of England, in the larger centres at all events, ether is probably used more frequently than the former for the induction of general anæsthesia. Moreover, there seems to be an almost increasing tendency for ether to be more often chosen in preference to chloroform, and, while fully realising that each has its own special sphere of usefulness, and that much discrimination should be employed in selecting the particular anæsthetic for each individual case, I cannot help thinking that some of the good qualities of chloroform are denounced as bad ones, while some of the bad qualities of ether are praised as good ones, and that the latter is not infrequently given without advantage and in unsuitable cases. I do not pretend to be in a position to discuss all the individual merits of each, or to express an opinion as to which of the two is, generally speaking, the better anæsthetic, but there is one class of cases in which, both theoretically and practically, ether ought not to be administered, and in which particular class of cases it is often the one anæsthetic specially chosen. Further, when given in these circumstances, a fatal termination frequently ensues, and death, although in my mind due to the administration of ether, is invariably ascribed to other causes, usually shock. The class of case to which I refer is one which closely approaches that of acute cardiac failure. Now, quite apart from elderly subjects, for whom ether is usually contra-indicated, there are plenty of instances in which a patient's general condition is manifestly very bad, and in which it is imperative that a general anæsthetic should be administered, and some inevitable operation performed. The heart is in a bad way; its action may be hampered by an excess of sub-pericardial fat, and, apart from any valvular disease, its

walls may be the seat of a greater or less degree of fatty degeneration, and possibly a small amount of dilatation may be present. Its action may have been greatly impaired by the existence, or the recent pre-existence, of a rheumatic myocarditis, some febrile disturbance, carcinomatous cachexia, anæmia, sapræmia, septicæmia, or any kind of toxæmic condition. Its muscular tone may be interfered with by defective innervation, caused by shock, neurasthenia, or other constitutional nervous disease. Clinically, the physical signs presented may be any, or all, of the following.

On auscultation over the precordium, the first sound may be rapid, short, faint, and distant, with possibly a suspicion of irregularity in length and rhythm. The second sound, though probably not foreshortened to so great an extent as the first, is muffled and flappy, and the usual sharply-defined click, caused by the closure of the valves, is lost. The radial pulse may be rapid, small, soft, weak, and ill-sustained, with perhaps a trace of irregularity in force or rhythm, or both. To sum up, it is the "heart" that is primarily failing to go on with its work, which organ can, at least temporarily, be compared with a tired-out horse at the end of a long day's run. Now, if ether is given, this tired heart is injuriously stimulated and is scarcely able to respond, and, by raising the general blood pressure the amount of work it has to perform is increased. It has still, however, most probably got a small amount of reserve energy left, and, this being so, if the operation is not too protracted, death will most likely not take place on the operating table. The heart may have, for the time being, managed to rise to the occasion, but action and reaction are equal and opposite, and now the pulse, which before the anæsthetic had almost a flickering tendency, just flickers out altogether. In this way, death may take place any time from roughly five minutes to a few hours after recovery from unconsciousness.

While writing this, I am citing two cases in particular or my own, to both of which I was specially requested to give ether, and reluctantly did so much against my wish. In each instance, although the administration of the ether was practically uneventful, death took place from fifteen to twenty minutes after regaining consciousness to the extent of being able to speak rationally. Surely, in such circumstances as these,

chloroform is the better anæsthetic. If chloroform is given, this tired-out horse is not whipped up, but, on the contrary, by putting an extra horse on in front to pull, it is rested ; in other words, the weak and weary heart is not stimulated, but the amount of work it has to perform is diminished by lowering the general blood pressure.

This progressive blood-pressure, lowering characteristic of chloroform accounts for its condemnation by not a few people, but, in such cases as these at all events, it is surely one of its greatest virtues. In further support of my contention, I would like to quote the following from "*The Lancet* and the Hyderabad Commissions on Chloroform." These commissions, after extensive experiments on dogs and monkeys, conclude that "chloroform has no power of increasing the tendency to either shock or syncope during operations," and say further that "if either shock or syncope from any cause does occur, it prevents, rather than aggravates, the dangers of chloroform inhalation. That in fatty degeneration of the heart, chloroform in no way endangers it, but, on the other hand, is a positive advantage, by virtue of lowering the blood-pressure and lessening the work it has to perform." Lastly, although it is quite recognised that ether not infrequently produces a variable amount of ether-bronchitis, and occasionally even a subsequent ether-pneumonia, yet I feel sure that the number of actual deaths from this exciting cause is not fully realised. Furthermore, elderly subjects are not necessarily the only ones in whom ether produces a significant amount of pulmonary mischief. In comparing the degrees of safety of the two anæsthetics, even statistics must be sometimes misleading, as both the first and the last-mentioned deaths are seldom, if ever, attributed to the administration of ether, although there can be no doubt that the anæsthetic is more or less directly instrumental in the causation of death. The number of times, too, that chloroform is given greatly exceeds that of ether, and the question naturally arises as to whether the two are always fairly compared.



NOTES FROM FOREIGN JOURNALS.

GOUTY SORE-THROAT, OR GOUT IN THE PHARYNX.

The frequently-discussed question of gout in the pharynx formed the subject of a comprehensive paper in the *Revue des Maladies de la Nutrition* by Canzard. His description of the affection contains the following points. It is most frequently provoked by an occasional and decided cause, such as a chill, an error in diet, a little overwork, or physical fatigue. It begins by a feeling of discomfort in the throat, which soon becomes an intense, insupportable pain of a shooting nature, preventing swallowing or making it extremely painful. The lesions present bear no relation to the pains. Inflammation, more or less diffuse, is present around the opening of one or more of the tonsillar crypts, and in the soft palate. The posterior wall is more frequently affected, and is difficult to be seen, appearing dry, red, and glazed. Infiltration is soon produced, giving rise to a darkened œdema, which spreads over the posterior edge of the palate, the pillars of the fauces, and the uvula. The tonsils themselves are swollen, one or the other often projecting beyond the middle line, while the anterior pillar of the same side is stretched and pushed forward. To all appearance an abscess is about to form in the tonsil. Dysphagia is not always the only subjective symptom of this panpharyngitis. The voice is often nasal in tone, and fluids return through the nose. The inflammation descends fairly often towards the larynx, giving rise to respiratory distress. The dyspnoea is sometimes so intense that, to all appearance, tracheotomy is required. There is no trismus, though opening the mouth gives rise to some pain. There is no greater amount of purulent, or of purulent, coating observed in the throat than in inflammation affecting the glands of the maxillary-pharyngeal region. Temperature does not exceed 102° F., and, as a rule, is under 101° F. The fever of gout expresses the reaction of the organism, which is accompanied by malaise, pain in the back, and dyspeptic symptoms. The urine is thick, loaded with urates, and of a high colour. Canzard applies the term panpharyngitis to this affection, because, as a rule, the whole of the pharynx is involved. It disappears almost as suddenly as it appears. Neither pus nor blood exudes from the throat. It is a metastasis from a joint, and occurs, as a rule, when the attack of gout is at its highest. Diagnosis is easy, because of the coincident affections of one or more joints. It is easily distinguishable from an herpetic sore throat, which is acute, sudden in appearance, and painful, but the vesicles reappear very quickly. The maxillary glands are always affected, and the temperature rises to and beyond 102° F. The phlegmon, accompanying tonsillitis, is more difficult to distinguish from the gouty sore-throat, if the lesions are chiefly one-sided; but the subsequent course allows a differential diagnosis to be made. As to treatment, colchicum and its different preparations afford the best relief for the patient. Gargles are a useful addition, better still are hot solutions of salicylate of soda to wash out the throat.—(*Journal de Médecine et de Chirurgie pratiques.*)

TREATMENT OF ACUTE CORYZA.

Lemoine of Lille, in a recent article, gave a large number of practical suggestions.

To abort a cold, a pinch of one of the following powders should be taken every hour:—

℞.	Cocainæ Hydrochloridi	-	-	-	gr. vijss.
	Mentholis	-	-	-	gr. iv.
	Salolis,				
	Acidi Borici	-	-	-	ana ʒss.
	Misce.				Fiat pulvis.

or,	℞.	Salolis	-	-	-	ʒiiss.
		Acidi Salicylici	-	-	-	gr. xxx.
		Acidi Tannici	-	-	-	gr. xv.
		Acidi Borici	-	-	-	ʒx.

Salol cannot always be trusted not to prove somewhat irritating, a better formula is:—

℞.	Cocainæ Hydrochloridi	-	-	-	gr. $\frac{1}{4}$.
	Aluminis	-	-	-	gr. xxx.
	Mentholis	-	-	-	gr. viiss.
	Pulveris Sacchari,				
	Acidi Borici	-	-	-	ana ʒv.

Insufflations may be made with—

℞.	Hydrargyri Subchloridi,				
	Morphinæ Hydrochloridi	-	-	-	ana gr. $\frac{1}{6}$.
	Bismuthi Subnitrat	-	-	-	ʒiiss.

On the other hand, Weitlauer, of Innsbruck, commends the internal use of salicylate of soda, combined with Dover's powder, which, it is said, will afford relief one hour after beginning treatment.

℞.	Sodii Salicylatis	-	-	-	ʒj.
	Pulveris Ipecacuanhæ Compositæ	-	-	-	gr. xlv.
	Spiritus Menthæ Piperitæ	-	-	-	℥j.

Misce. Fiat pulvis.

To be divided into 20 portions, one of which is to be taken in a little water every three or four hours.

At a more advanced stage, when the nature of the secretion has changed, inert or antiseptic powders should be prescribed.

℞.	Cocainæ Hydrochloridi,				
	Morphinæ Hydrochloridi	-	-	-	ana gr. $\frac{1}{4}$.
	Acidi Tannici	-	-	-	ʒiiss.
	Bismuthi Salicylatis	-	-	-	ʒv.
	Acidi Borici,				
	Pulveris Talci	-	-	-	ana ʒvj.

Misce. Fiat pulvis.

"One pinch to be taken every two hours."

or,	℞.	Cocainæ Hydrochloridi	-	-	-	gr. $\frac{1}{6}$ -j.
		Camphoræ	-	-	-	gr. j.
		Pulveris Sacchari	-	-	-	ʒij.
		Morphinæ Hydrochloridi	-	-	-	gr. j.
		Pulveris Gummi Acaciæ	-	-	-	ʒj.
		Bismuthi Subnitrat,				
		Pulveris Malvæ	-	-	-	ana ʒiiss.

For the application of antiseptics to the nasal fossæ, Lemoine prefers

make use of ointments, in which different substances can be associated in order to increase the antiseptic effect.

℞. Cocainæ Hydrochloridi,

Salolis	-	-	-	-	ana	gr. $\frac{1}{3}$
Mentholis	-	-	-	-	-	gr. ss.
Acidi Borici	-	-	-	-	-	ʒss.
Paraffini Mollis	-	-	-	-	-	ʒj.

Misce. Fiat unguentum.

"A piece, the size of a large pea, to be placed in each nostril three or four times a day."—(*Journal de Médecine et de Chirurgie pratique.*)

COLLYRIA, ISOTONIC TO THE TEARS.

In the *Archives d'Ophthalmologie*, Cantonnet gives the results of his experiments as to the value of using for washing and bathing the eyes a solution of salt isotonic to the tears. It is a solution of 14 grammes (210 grains) of chloride of sodium in 1 litre (35 fluid ounces) of distilled water. This solution does not set up osmotic action, and is, therefore, not hurtful to the cells by reason of its molecular composition. At the Hôtel-Dieu, in the wards of M. de Lapersonne, the solution has been tried for some time. It appears to be the best liquid for aseptic washing of the eye. It may be used both before and after operations, and for all purposes of ocular asepsis. The instillation must not be forcible. The temperature should be about 95° Fahr.

A priori, this solution should be preferred at the time of prolonged contact of a fluid with the eye, as in the hydrodroscoy of Lohnstein. Lastly, a fragment of cornea, or conjunctiva, removed in the course of an operation, which could not be fixed in place at once, could be with advantage preserved in this solution.

LAXATIVES IN HYPERCHLORHYDRIA.

Linossier advises the following laxative preparations as more especially suited to cases of hyperchlorhydria. If this condition requires correcting towards the end of digestion, an alkaline powder is then given, in which magnesia is the chief constituent. Otherwise, one or two teaspoonfuls of the following are given after the evening meal in half a glassful of water:—

℞ Magnesiæ,

"Sel de Seignette,"

Lactosi - - - - - ana ʒij.

Pulveris Glycyrrhizæ - - - - - ʒj.

Or, on waking in the morning, a teaspoonful of:—

℞ Sodii Sulphatis,

Sodii Phosphatis,

"Sel de Seignette" - - - - - Partes æquales.

—(*Hygiène des dyspeptiques.*)



Reviews of Books.

A System of Syphilis. Edited by D'ARCY POWER, M.B., F.R.C.S., and J. KEOGH MURPHY, M.D., M.C., F.R.C.S., with an introduction by Sir JONATHAN HUTCHINSON, F.R.S., F.R.C.S. London: Oxford Medical Publications. In six volumes. Each volume, 2 guineas net.

IN addition to the interesting and valuable introduction contributed by Sir Jonathan Hutchinson, volume I. contains a most interesting article by Dr. Iwan Bloch of Berlin, which gives an account of the history of Syphilis, an article on the Microbiology of Syphilis by Professor Elie Metchnikoff, translated by Dr. J. Keogh Murphy, and an article on the general pathology of Syphilis by Dr. F. W. Andrews. Colonel F. J. Lambkin of the R.A.M.C. contributes the article on the Early Manifestations of Syphilis in the Male, which is beautifully illustrated, many of the illustrations being from direct colour-photographs. Mr. A. Shillitoe, F.R.C.S., contributes an article on the Early Manifestations of Syphilis in the Female, while the article upon Congenital Syphilis is from the pen of Dr. G. F. Still.

Volume II. commences with a very able and exhaustive article on the Surgery of Syphilis by Mr. D'Arcy Power. Colonel F. J. Lambkin deals very thoroughly with the treatment of Syphilis, and an outbreak of Syphilis in a virgin soil, which includes notes on Syphilis in the Uganda Protectorate. Dr. William J. Gow contributes an excellent article on Syphilis in Obstetrics.

It will be seen from this description that the various articles in the *System* are contributed by those who have made Syphilis their special study in that particular branch of Medicine, Surgery, or Gynæcology to which they have given their attention. There is of necessity some repetition, and a certain amount of overlapping in these articles, but it is difficult to see how the Editors could have avoided this, and we consider that they are to be congratulated upon the general excellence of the work. The articles are the most exhaustive of their kind, the illustrations are without exception clear, and well executed, and there is no doubt that, if the volumes which are to follow are as thorough and practical as the two before us, this *System* will become the standard work on Syphilis.

Trypanosomes and Trypanosomiasis. By A. LAVERAN and F. MESNIL.

Translated and much enlarged by DAVID NABARRO, M.D., B.Sc., D.P.H. Pp. 538. London: Baillière, Tindall & Cox.

THIS work is a very complete survey of an important group of protozoan parasites, which is now attracting so much attention. All the known species of trypanosomes are dealt with, and the important ones are discussed under the headings of historical review and geographical distribution, general morphology and biology, pathogenicity, and pathological action, mode of propagation, prophylaxis, and treatment. The book is not merely a translation of Laveran and Mesnil's work, but includes additions to our knowledge since its publication; these have been incorporated by the translator. The chapter on human trypanosomiasis is a particularly good one, as might have been expected from the translator's practical acquaintance with, and experimental researches on, this disease. A special chapter on the treatment of trypanosomiasis is included, and the tse-tse flies receive adequate

consideration.

Tropical Medicine, Hygiene and Parasitology. By GILBERT E. BROOKE, M.A., L.R.C.P., D.P.H. Pp. 498. London: Charles Griffin & Co. 12s. 6d. net.

This book contains a large amount of information in a small compass and will be a very useful companion for the practitioner in the Tropics. It includes a number of practical "tips," which will prove invaluable to the medical man commencing tropical practice. Clothing, exercise, food, and pregnancy, and the rearing of infants, are dealt with; the various parasites, mosquitoes, flies, ticks, and snakes are briefly described, after which individual diseases are discussed. We note the omission of eucalyptus oil as a remedy for ankylostomiasis, and of Ashburn and Craig's work on dengue, and no mention is made of vaccine treatment in Malta fever. Chapters towards the end deal with microscopy, photography, disinfection, and the examination of the blood. Appendixes are added on international sanitary conventions, vegetable poisons, collection of insects, dosage, life insurance, etc. The book is illustrated with many excellent plates and figures.

Uric Acid as a Factor in the Causation of Disease. By ALEXANDER HAIG, M.A., M.D., F.R.C.P., Physician to the Metropolitan Hospital and the Royal Hospital for Children and Women; late Casualty Physician to St. Bartholomew's Hospital. Pp. 940. London: J. & A. Churchill. 14s. net.

ALTHOUGH Dr. Haig is at variance with nearly all of his professional brethren who have studied this subject, as to the actual harmful effect of uric acid and its allies, still we must give him credit for an immense amount of hard work, and we must remember that he writes with a great deal of clinical experience behind him. The actual place in pathology of uric acid is a subject on which a great deal of work has been done, and the general conclusion is different from the view taken by Dr. Haig. To put the matter shortly, Dr. Haig looks upon this body as a *cause* of disease, nearly all others, who have worked at the subject, regard it as only a by-product of a much deeper change in the metabolism of the body; a by-product which is practically innocuous.

This makes it difficult to criticise a book which is based on the theory that uric acid is toxic in itself. There is, of course, a multitude of points, with regard to the pathology of uric acid and its allies, which are not yet cleared up; for example, why does uric acid remain in the system under certain conditions, and what is the substance with which it appears to be temporarily combined? Uric acid and its cogeners have many times been proved from physiological experiments to be practically non-toxic, and our aim at present is to find the substances, which produce the changes in metabolism of which uric acid is the by-product. The fact that many people, especially those who habitually eat too much, do well on a purin-free diet, proves little or nothing, and we do not for a moment deny that there are many people who do well, if put on this form of diet *for a short time*. But we cannot say that it is good for the majority of patients. We know a man who cured himself of severe rheumatism by the adoption of a Salisbury diet, but, surely, no medical man would recommend this

treatment to anyone suffering from this complaint.

We are sorry that few medical men agree with the theories at the basis of this work, as the book contains a great many useful clinical suggestions.

Hernia: Its Cause and Treatment. By R. W. MURRAY, F.R.C.S., Surgeon, David Lewis Northern Hospital, Liverpool; late Surgeon, Liverpool Infirmary for Children. London: J. & A. Churchill. 4s. 6d. net.

In the preface, Mr. Murray states that any man who adds to the literature of hernia should have good reason for doing so, and he adduces two reasons for the appearance of this book—(1) to bring forward some additional pathological and clinical evidence in favour of the saccular theory of the origin of hernia; (2) his method of operating, which is based on the view that the presence of the sac is the essential cause of the hernia. The author considers that the saccular theory offers the only satisfactory explanation of all abdominal herniæ, which have not a definite traumatic origin, and there is a great deal to be said in favour of this view. We entirely agree with him in laying such stress on the complete extirpation of the sac as being the most essential feature in the radical cure by operation, and that the means taken to strengthen, or obliterate, the canal should always be secondary to this primary consideration, and in fact, in many cases, e.g., in infants and children, they are unnecessary. If this point had been more appreciated, it is probable that many of the complicated operations, which have been devised, would not have been practised. A section devoted to the geographical distribution of hernia, and an appendix of the cases, operated on by the author, complete the book, which is a valuable contribution to the literature of the subject.

Glandular Enlargement and Other Diseases of the Lymphatic System. By ARTHUR EDMUNDS, M.S., F.R.C.S., Surgeon to the Great Northern Central Hospital: Assistant Surgeon to the Paddington Green Children's Hospital. London: Oxford Medical Publications. 7s. 6d. net.

THIS book makes no pretensions to being an exhaustive treatise on the diseases of the lymphatic system. Only those pathological conditions, in which affections of the lymphatic glands or vessels constitute the essential features of the disease are considered, and being written by a surgeon, the book deals with these from a surgical standpoint. In the diagnosis of diseases of the lymphatics and enlargement of the glands, it is frequently necessary to decide whether such affections are a part of some constitutional condition, and Mr. Edmunds has devoted two chapters to a discussion of this aspect of the subject. The book is divided into chapters, each devoted to some special affection, and we would specially mention the chapters on the diagnosis of glandular enlargements; tuberculous disease of the glands, in which an excellent account of the method of operating is given; and that on the operative treatment of secondary malignant glands. There are also useful chapters on lympho-sarcoma, and the treatment of inoperable malignant glands. One chapter is headed "Lymphagio-Endotheliomata," which is a very cumbersome term, and there does not appear to be any good reason for employing it; moreover, throughout the whole chapter the term endothelioma is used. It would also have been better to have headed Chapter XII., "Treatment of Tuberculous Glands by Tuberculin," instead of "The Vaccine Treatment of Tuberculous Glands." There are several illustrations which add to the value of the book.

Notes by the Way.

The General Practitioner.

IN medical practice, as in other matters, the march of progress is, as Herbert Spencer puts it, from "indefinite incoherent homogeneity" to "definite coherent heterogeneity"; and there are not wanting pessimists who predict the elimination of the general practitioner as the result of the working of this law of evolution. Certainly his position in the world tends to be altered by the rapid spread of medical knowledge. On the one hand, the layman is less ready than of old to credit doctors with omniscience, and has an increasing confidence in his own power to treat himself for such simple disorders as can be set right by a dose of cascara, a few tabloids, a mixture of quinine and iron, an abstemious diet, or a week at the seaside. On the other hand, there is infinitely more medicine to be known than of old. Medical discoveries succeed each other with much greater rapidity; and the general practitioner, though as hard-worked as ever, has more difficulty in keeping himself abreast with the latest speculations and researches. There are men who, desiring, above all things, an easy and comfortable life, settle down in country places, out of touch with the populous centres, cease to study, and never learn anything except what actual experience directly thrusts under their noses. It is a pity, and it is not in the least necessary; for, though the general practitioner cannot be a specialist, as the word is understood at the hospitals, and in Harley Street, he may be a specialist in an important way of his own. He may be—indeed he must be a fool if he is not—a specialist in minor ailments; and he might be, far more often than he is, a specialist in preventive medicine—the respected guide as to the general health of his *clientèle*, not waiting, to take the first instance that occurs to us, until the septic mouths of children have set up some general pathological disturbance, but reminding the well-to-do that their children, no less than the children of the poor, need to be inspected periodically with a view to the detection of carious

teeth before their first line of defence against infectious disease has broken down.

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Opportunities of Study.

IN the Army and Navy, and the Indian Medical Service, the need for post-graduate study is recognised. Men are granted leave of absence in order that they may engage in it, their fees being paid, and their stipends continued. The necessity is not really any the less in the case of men engaged in private practice ; and post-graduate courses are arranged at a great many of the hospitals for their benefit. Men, who are working in partnership, ought certainly to arrange with each other for occasional leave of absence, in order that they may avail themselves of these advantages. Solitary workers, of course, can but seldom quit their practices for such purposes—though a great many colonial doctors, who have managed to do so, are to be met at the London hospitals ; but even they need not lag too far behind contemporary knowledge. They have books and they have journals in which articles relating to the work of research which is always unostentatiously going on are published from time to time, in order that the general practitioner, in spite of his hard work and heavy handicap, may not feel himself altogether an exile from the centres of scientific progress. Moreover, remembering what Gray said about the flowers born to blush unseen, THE PRACTITIONER always welcomes, and often publishes, the experiences of those general practitioners who, like Ian Maclaren's doctor of the old school, labour with love and self-denial, and with intelligent initiative and thought, in the interest of a remote and needy constituency.

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Eugenics.

WE have had something to say about eugenics before now ; and a lecture by Dr. Saleeby in Clifford's Inn, followed by a discussion, furnishes an excuse for returning to the subject. The wisest of the speeches, it seems to us, was that of Mr. Frederic Harrison, who insisted upon "the necessity of being

very careful indeed and of going in a very guarded way." The fact of the matter is that the science of eugenics is at present in its infancy, and that the enthusiasts would be better occupied in investigating it quietly than in bombarding the world with proposals to base drastic laws upon hasty generalisations. We know very little as yet of the mysterious principles of heredity, and we are still less able to foresee what would be the practical effect of attempting to enforce regulations, founded upon such scanty knowledge as we have, upon a world reluctant to submit to them. Dr. Saleeby talks airily of establishing what he calls "eugenic selection"; but one needs to know, before agreeing with him, or even before arguing with him, what is the precise nature of the selection which he so describes, and what precise machinery he advocates for its establishment. It is easy enough for us to make eugenic experiments with plants, because the plants are absolutely under our control. They have no volition, and cannot evade our authority. The case of our fellow creatures is widely different. They know, within limits, what they want, and what they do not want, and, if their strong desires are thwarted, we can rely upon them either to revolt against their legislators, or to defeat them by passive resistance.

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**Eugenics and
Race-Suicide.**

THERE is, of course, a subtle and intimate connection between the advocacy of eugenics and the denunciation of "race-suicide"; but here again there seems to be undue cocksureness and some tendency towards rhetorical exaggeration of the evil attacked. The effect of modern educational methods, according to Dr. Saleeby, is to sterilise the fittest. Clever girls, he declares, unfit themselves for maternity by the labour of preparing for examinations. Undoubtedly some girls do so; but how many? Our own experience of girls, as of boys, is that the vast majority of them expend too little rather than too much energy on their studies; and we are quite sure that we should hear little about the alleged revolt against maternity, if examples of it were only to be found among the over-educated. Quite other causes—economic causes for the more part—are at work, just as they were in the days of the

Lex Papia Poppæa; and any philosopher, who seriously imagines that he can alter the condition of things by simplifying the curriculum in Academies for Young Ladies, is cherishing a vain illusion. The Socialists, of course—a certain section of Socialists, at all events—have their remedy. If the State wants children, they argue, the State will have to pay for them; and, though this is not the place in which to discuss Socialism, we feel that this particular socialistic demand is more likely to touch the hearts of the people than any amount of eugenic exhortation.

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**The Physique of
the Race.**

MEANWHILE it is practical and important to bear in mind that the recommendations of the Eugenicists are not the only means at our disposal for improving the physique of the race, and also that the propagation of the unfit is only one among many of the factors which make for physical deterioration. The child of unfit parents, healthily brought up amid hygienic surroundings, has, after all a better chance, *ceteris paribus*, than the child of fit parents, fed in infancy on unsuitable food, inadequately clad, and constantly breathing foul and foetid air. The former may be hardened in spite of inherited weaknesses; the latter may quickly degenerate in spite of an originally strong constitution. These are facts which we have lately begun to recognise; and the recognition of them is at the root of many recent and impending reforms; the arrangements, for instance, for the inspection of milk, and of public elementary school children's teeth, and heads, and noses, and the attempts, not yet so successful as they might be, to disseminate information as to the value of fresh air, and to teach the mothers of the poorer classes that it is not a sound policy to feed babies on mixed pickles in the hope of "hardening their insides." A great many of the results, at which the Eugenicists are conscientiously aiming, can in all likelihood be obtained more rapidly by these means; and in the meanwhile, there will, perhaps, be time to establish eugenics on a sounder scientific basis than that which it at present occupies.

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NOT, of course, that we wish to depreciate Exaggerations. the work that the Eugenicists are doing, or rather trying to do. With some of their demands we sympathise, though we should like a little fuller information before definitely committing ourselves to the support of their proposals. If they can find a means of preventing not only the marriage, but also the parentage of the feeble-minded, without undue interference with the liberty of the subject, and without placing undue power, liable to abuse, in the hands of those who will have to determine whether a given person is feeble-minded or not, well and good. But even on this branch of the subject, they seem to us a little prone to the exaggeration commonly associated with stump oratory. One might infer from the speeches made by some of them that a feeble-minded person was commonly regarded as an exceptionally eligible "parti"; but that is not the case. The general instinct of the race is perfectly sound in the matter; and the picture of the feeble-minded pursued with offers of marriage, as if they were Gaiety girls or American heiresses, is a misleading one. There are exceptions to the rule, no doubt; but the peril is by no means so ubiquitously menacing as the alarmists sometimes give us to understand, and the legislator will therefore do well, as Mr. Frederic Harrison says, to go slowly and walk warily.



Practical Notes.

TREATMENT OF LEAD POISONING.—Metchnikoff's views as to the importance of phagocytosis in the process of recovery from microbic infections have been extended by him and his school, for many years, to the process of neutralisation of toxins and simpler poisons. Metchnikoff has shown, for instance, that when tetanus toxin is injected into a fowl (an animal which is immune thereto) the poison is absorbed to a very large extent by the leucocytes. This is shown by the fact that, if a sterile abscess is produced after the injection of the toxin, the pus-corpuscles thereof will cause fatal tetanus in a susceptible animal. Carles, of Bordeaux, has recently shown that exactly similar facts apply in the case of lead, and has proposed a method for the treatment of saturnism based on his observations in animals. Thus he administered 2 centigrams of minium daily for a week to a dog weighing 1,400 grams. Two days after the drug was given for the first time, he injected half a cubic centimetre of essence of turpentine subcutaneously in the dorso-lumbar region. At the end of the week an abscess containing 26 cc. of pus was formed. The animal was killed, and the amount of lead (estimated as sulphide) in the pus and in similar amounts of other organs, etc., was found. The pus was found to contain .005 gram, the liver .003, the intestine and brain an unweighable trace, whilst the blood was free. Similar findings were obtained in other experiments, and Carles now reports two cases in which the treatment has been applied clinically. In the former the patient had not been exposed to lead for more than three months, and presented a marked lead line on the gums, and a little tremor. He was injected with 1 cc. of essence of turpentine into the left calf. (The treatment was actually undertaken for other purposes, and the fact that he was suffering from lead poisoning was merely a coincidence). An abscess formed and 32 grams of pus (roughly 1 ounce) were evacuated, and were found to contain $2\frac{1}{2}$ milligrams of lead, estimated as sulphide. The presence of this amount in the pus from a patient, who had not been exposed to the poison for more than three months, is somewhat remarkable.

In a second case, the same method was employed for the treatment of definite attacks of lead colic. The patient was

a woman, who used a preparation of lead in her work, and who had had three attacks of colic in eight or ten days. The attacks were associated with abdominal retraction and vomiting, and there was a faint blue line on the gums. An injection of 1 cc. of essence of turpentine was given, and a small amount of pus formed: this was found to contain 1 mgr. of lead (estimated as sulphide).

The objection to the process is its painfulness, which was especially marked in the last case. There appears to be such definite proof of the fact that lead may actually be eliminated from the body in this way, that it would be desirable to see whether some less painful method—possibly the old-fashioned seton or issue—and one in which the formation of pus is more prolonged, might not be equally, or more, efficacious. The inadequacy of the old methods for abstracting lead, which has become locked up in the system, is well known.

TREATMENT OF TETANUS BY SUBARACHNOID INJECTIONS OF MAGNESIUM SULPHATE.—The experiments of Meltzer have shown that, so far from being the inert substance it is usually supposed to be, magnesium sulphate has a profound inhibitory action on all nervous structures. When applied to a nerve, it interrupts the passage of stimuli, and when injected subcutaneously produces profound narcosis, and complete muscular relaxation. This has led to its use as an anæsthetic, but there were found to be certain drawbacks in its application, although it was thought to be of value in certain cases. But it was also suggested that it might be of great advantage in the treatment of tetanus. Thirteen cases are on record in which the suggestion has been put into practice, and Miller has recently added another. Of the 14, 11 were treated by subarachnoid injections, with 5 recoveries; nearly all the cases were severe ones, in which the prognosis, on any other method of treatment, is almost hopeless. The other 3 were treated by infusion, and all recovered; they were all slight cases. The treatment is not entirely devoid of danger, and should not be used indiscriminately.

Miller's case was a severe one, and developed after an incubation period of 7 days. The patient was admitted on the tenth day after the accident (a lacerated wound of the left hand). He was anæsthetised, lumbar puncture per-

formed, and $2\frac{1}{2}$ cc. (about 42 minims) of a 25 per cent. solution of magnesium sulphate injected into the spinal canal. This was repeated almost daily, 11 injections being given within 13 days; antitoxin (1500 to 7000 units) being given at the same time, 14 doses being given in all. After each injection the reflexes were abolished, and there was more or less paralysis, and a very marked slowing of the respirations, which fell as low as 6 a minute: the patient was closely watched, since it was thought that artificial respiration might be necessary. The results of the injection gradually became less, and the patient's condition slowly improved, and he was discharged cured about a month after the accident. Miller remarks that no one who saw the case could have any doubt as to the value of the treatment. When the patient was in violent spasm and continuous opisthotonos an injection reduced him to complete and lasting relaxation in the course of a few minutes: the improvement lasted from $10\frac{1}{2}$ to 29 hours.

Miller points out that a chief cause of death in tetanus is asthma, due to the violent muscular exertion during the spasms, and that, by diminishing these, more time is given for the development of natural recovery. The treatment seems worthy of full trial: the drug is always at hand and the process of administration an easy one, and the results, recorded so far, seem better than those obtained from any other agent.

ENTEROCOLITIS IN YOUNG CHILDREN.—La Fetra, of New York, recommends calomel and castor with colon irrigations and lavage of the stomach in severe cases with sunken fontanelles, low temperature, etc. In patients without depression he recommends (for a child of nine months):—

R Sodii Sulph.	-	-	-	ʒiiss.
Syr. Zingiberis	-	-	-	ʒiij.
Aq.	-	-	-	ad ʒij.

A teaspoonful in water every half hour for four or five doses.

For child of two years:—

R Sodii Sulph.	-	-	-	ʒiij.
Aq. Cinnamonii	-	-	-	ʒiij.

Dose as before.

When vomiting is persistent he gives calomel dry on the

tongue :—

R	Calomelanos	-	-	-	gr. j.
	Sacchari Lactis	-	-	-	gr. xv.
	Fiat Chartulæ	-	-	-	x.

One powder every half hour.

He recommends weak tea as a mild stimulant and slightly astringent drink.

THE DIET IN DIABETES.—The use of potatoes in the dietary of diabetics is now well understood. They contain less starch in proportion to their bulk than does bread or toast, and the starch present appears to be tolerated better than that from other sources. In addition they contain a large amount of potassium salts, which Mosse claims to be of benefit. Von Noorden holds that oatmeal is even better than potatoes, and states that many diabetics, especially severe cases with marked acetonuria, secrete much less sugar when taking large quantities of oatmeal, than when on a strict carbohydrate-free diet. This oatmeal food is prepared thus : $8\frac{1}{3}$ ounces (250 grams) of oatmeal are cooked for about two hours on a moderate fire with 3 or 4 quarts of water and a little salt : 100 grains of proteid substances, such as roborat, gliden, or rice albumen, may be added. Then add 10 ounces (300 grams) of butter and pass through a sieve. Divide into eight parts and take one every two hours.

When the porridge is ordered for a single meal only a larger proportion of butter may be added. Thus : to 1 ounce of oatmeal add 2 ounces of water and allow it to soak overnight. Next day add 3 to 5 ounces water and cook 2 hours in a water boiler. Half an hour before it is finished add $2\frac{2}{3}$ ounces of butter.

In von Noorden's system days on which these gruels alone are allowed are alternated with "stringent days," "starch days," and "vegetable days."

Tyson, from whom the foregoing recipes are taken, points out that it is only in severe cases of diabetes in which the addition of a considerable amount of carbohydrate is indicated, so as to prevent the production of acidoses. In mild cases, the best diet is that which effectually removes the sugar from the urine.

Preparations, Inventions, etc.

NOTEWORTHY ADDITIONS TO VACCINE-THERAPY.

(Messrs. Parke, Davis & Co., Beak Street, Regent Street, W.)

We have received three new vaccines from Messrs. Parke, Davis & Co., which have been issued by the Department for Therapeutic Inoculation at St. Mary's Hospital. Two of these are provided for the treatment of varying forms of acne. One c.c. of the *mixed vaccine* for acne contains 8 million acne bacilli and 200 million staphylococci, and is to be used in cases, in which the staphylococcus plays the most important part in the disease, in which the lesions assume a subfuruncular form. One c.c. of the *acne bacillus vaccine* contains 8 million acne bacilli, and is applicable for cases in which the staphylococcus, if present, is a subordinate factor as in non-pustular forms with comedones as a principal feature. The *Neoformans vaccine* is used as an auxiliary to other treatment of cancer; it relieves pain by suppressing local inflammation. It is prepared from the micrococcus neoformans of Doyen, and 1 c.c. contains 30 million cocci. These vaccines are issued in bulbs of about 1 c.c., and also in bottles of 25 c.c.

DIAMALT.

(The British Diamalt Co., 11 and 13, Southwark Street, S.E.)

"Diamalt" is diastasic malt extract in liquid form. On analysis it is found to be a pure extract of malt of high quality with no foreign ingredient present. It is capable of rapidly digesting starch, and, in fact, has a higher digestive power than many other malt extracts. It contains 5.8 per cent. of protein. It has an excellent flavour, and is highly palatable. We cannot congratulate the Company, however, upon the way the preparation is sent out. The tin, in which it is contained, suggests a pot of enamel paint, rather than a vessel containing an important food. We have no doubt, however, that this objection will be removed, so that Diamalt can be supplied in a neater-looking form.

FORMITROL PASTILLES.

(Messrs. A. Wander, 1-3, Leonard Street, City Road, E.C.)

These pastilles are a combination of Formaldehyde and Lactose, and form a very efficient substitute for gargles, and

they are therefore particularly useful for children. The Formaldehyde communicates bactericidal properties to the saliva, and is most beneficial in local infections due to streptococci and pneumococci. The pastilles are harmless, and may be taken, if necessary, every hour. They are supplied in tubes, each containing 30 pastilles, and in smaller tubes, each containing 10 pastilles.

‘VAPOROLE’ PRODUCTS.

(Messrs. Burroughs Wellcome & Co., Snow Hill Buildings, E.C.)

We have received from Messrs. Burroughs Wellcome & Co. two specimens of their ‘Vaporole’ products for hypodermic injection, viz.: ‘Vaporole’ Cocaine Hydrochloride, containing .01 gm. in 1 c.c., and ‘Vaporole’ Morphine Hydrochloride, also containing .01 gm. in 1 c.c. These very convenient preparations are supplied in hermetically-sealed containers, each has the stated weight of medicament, dissolved in water or suspended in a fluid vehicle, sterilised, and ready for immediate hypodermic injection. They are supplied in boxes, each box containing 10 phials.

STARCHLESS AND SUGARLESS DIABETIC FOODS.

(Messrs. R. Green & Sons, 76, Chalk Farm Road, N.W.)

The Starchless and Sugarless Foods which have been submitted to us by Messrs. R. Green and Sons are of the best quality, and, so far as such foods go, they are particularly palatable. They will be found to be exceedingly useful in cases of Diabetes mellitus and in some forms of chronic gout and rheumatism. We consider that the price is very moderate, and that the foods, when compared with other similar preparations, may be looked upon as an economical diet.



THE PRACTITIONER.

JUNE, 1909.

THE BEARINGS OF PATHOLOGY ON THE PREVENTION, DIAGNOSIS, AND SURGICAL CURE OF CARCINOMA OF THE CERVIX.

By VICTOR BONNEY, M.S., M.D., B.Sc., F.R.C.S., M.R.C.P.,

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SOME PATHOLOGICAL CONSIDERATIONS.

A STATISTICAL investigation of 1,876 cases of carcinoma of the cervix, dying in the incurable cancer wards of the Middlesex Hospital, and carried out by A. Leitch at the Middlesex Hospital cancer investigation laboratories, showed that no less than 1,790 of them were married women, only 9 per cent. of whom were sterile. The disease, therefore, bears a very striking relation to the exercise of the sexual functions, intercourse, and child-bearing. The reason of this is to be found in the fact that every case of carcinoma of the cervix is, as I have previously shown,¹ founded upon a chronic cervicitis of very definite histological characters.

If a portion of the normal virgin cervix be examined under the microscope, it is seen that the epithelium covering it is squamous in character, and about half-a-dozen cells thick, and is applied to the subepithelial tissue as a plane sheet, differing in this particular from the arrangement of the cutaneous epithelium, which exhibits a series of downgrowths which interlock with the papillar upgrowths of the corium.

Immediately underlying the epithelium of the normal cervix is a fine plexus of yellow elastic tissue, to which I would draw special attention, because elastic fibres are the earliest structures to disappear from a part the seat of chronic inflammation. Once destroyed they are never regenerated,

and hence their absence from an area, in which they are normally found, is a very delicate indicator of past inflammatory change.

If, now, a section from a cervix in an early stage of "granular erosion" be examined, it will be noticed that the subepithelial tissue is packed with a number of lymphocytes, and the epithelial cells appear to be loosened in their connections with one another. Many of their more superficial members are desquamated. At certain points so thin is the epithelial covering that the inflamed connective tissue practically reaches the surface. These areas form the punctate hæmorrhages which appear if the surface of the erosion is roughly rubbed. The elastic plexus is seen to be largely broken up coincidently with or actually by the lymphocytal proliferation.

At a later stage, the inflamed connective tissue is actually raised in papillary processes, over the apices of which the epithelium is altogether absent, though it persists in the intervals between them. This is the stage of "papillary erosion." The character of the proliferating subepithelial connective tissue cells now begins to differ from that met with in the earlier stage. Lymphocytes are still present, but besides them are others staining specifically with certain aniline dyes, and called plasma cells, and, in addition, there is a considerable proliferation of the hyaline connective tissue cells. The elastic plexus by this time has either entirely disappeared, or, if persisting, has a new layer of cellular connective tissue intercalated between it and the epithelium.

Up to this time, epithelial growth has been inhibited, but, in the next stage, evidences of an increasing activity of the epithelial cells are manifest. This shows itself first in the deeper layers, which tend to grow downwards between the upthrown excrescences of the subepithelial connective tissue, a system of papillæ and interpapillar processes being formed in the same manner as normally obtains in the skin. Certain of these downgrowths take on a glandular character, and all pre-existing glands become hypertrophied and tortuous. This is the stage of "glandular erosion."

In the succeeding stage, the surface epithelium steadily thickens, until it has reached a depth much greater than ever

before. The superficial cells become "cuticularised," *i.e.*, they exhibit a number of fine eleidin granules within them, along a certain subsurface zone, whilst the actual surface cells are frequently definitely keratinised. The subepithelial connective tissue is still crowded with inflammatory cells, which are chiefly of the plasma cell and fixed connective tissue type. The elastic plexus has either disappeared, or is separated from the epithelium by a layer of new tissue. The thickening of the epithelium blocks the ducts of exit both of the pre-existent and newly-formed glands, and numerous cysts are formed, known as the "ovules of Naboth."

It is interesting to consider the symptoms exhibited by the patient at this stage. In the earlier phases of the disease, leucorrhœa is a marked feature of the case, but now it either ceases or becomes much lessened. On inspection, the external os will be seen to be surrounded by a whitish zone, studded with little bluish elevations. This zone is the area of epithelial thickening, and the bluish elevations are the retention cysts showing through it.

The cervix is now commonly said to be "cured" or "healed," but it needs but a moment's consideration to appreciate that there is no cure in the sense of a return to the normal, for the relations between the epithelium and its subjacent connective tissue are permanently altered.

This is the precarcinomatous state, from which the further march of events may be in one of two directions.

In the first and favourable one, the inflammatory condition of the subepithelial tissue passes on to a diffuse fibrosis, which tends to starve the hypertrophied epidermis into a lessened exuberance, and progressively diminishes the chance of carcinomatous ingrowth supervening.

In the second and unfavourable one, a continuance of the cellular condition of the subepithelial tissue is associated with an increasing proliferation of the epithelium, until the downgrowth of the interpapillar processes passes the limit of innocency and becomes frankly malignant.

PROPHYLAXIS.

I believe that, according to the Registrar-General's returns, one in every eight women, over the age of 35 years, is fated

to die of malignant disease of some kind or other. Carcinoma of the cervix will probably account for some 20 per cent. of those thus dying. The importance, therefore, of finding some means of saving womankind from this terrible penalty of marriage and child-bearing is very great.

One hopes, as the outcome of the enormous amount of research work now being carried on, that one day we may be able to immunise human beings against malignant disease, but, until that happy era dawns, we must be content to do what we can on the very definite and certain knowledge of the antecedents of the disease which we now possess.

Intercourse and childbirth—cervical laceration and cervicitis—carcinoma—thus runs the sequence. We cannot interdict the first two factors. But what of the second two? Cervical laceration of some degree, more or less, occurs in most first labours. In these days every perinæal laceration is at once sutured, but, at present, the same rule does not apply to the cervix. I believe that the time will come when no labour will be considered as adequately conducted in which a cervical laceration of any considerable depth is not at once closed. The practical difficulties in the universal adoption of such a proceeding are very great, but it will come, I am sure.

I believe also that the practice of careful antiseptic douching after labour until all discharge has ceased is of great importance. Many a cervicitis, initiated in the puerperium, is the direct antecedent of the growth that kills the patient years after. There can be little doubt, I think, that carcinoma of the cervix is much commoner amongst the lower classes than amongst the upper, because of the superior medical supervision which the latter are able to command. Every parous woman over 30 years of age, who suffers from chronic cervicitis, carries about in her the potential antecedent of carcinoma of the cervix, just as every man with a chronic superficial glossitis is liable to malignant disease of the tongue. This is recognised in the latter case, and the importance of avoiding and treating the antecedent disease is admitted. But carcinoma of the cervix, up to the present time, is generally regarded, in spite of the known facts I have stated, as an "act of God."

It is incumbent on the profession to impress upon married women that chronic leucorrhœal discharges should at once be

treated. In cases of advanced cervicitis, the best treatment, in the patient's interests, is to amputate the vaginal cervix. It is an easy and successful operation, and is followed by no ill results. It is certain that, could we remove the vaginal cervix from all women over 35, a considerable saving of life would be effected.

EARLY DIAGNOSIS.

A carcinoma of the cervix, in its initial stage, is so rarely met with that many of us can have no certain knowledge as to what it looks like. In a considerable experience I have seen but two such.

One presented the form of a small ulcer with sharply cut edges some quarter of an inch in diameter. The rest of the cervix showed the chronic inflammatory changes which I have described. The ulcer was so small, and so unlike the typical picture of malignancy, that only the microscope proved its nature.

In the second case, on one lip of a cervix presenting typical old inflammatory changes, there was situated a tiny nodule, the size of a small pea, which bled readily. A portion of this was excised, and was reported by a competent pathologist not to be malignant. Six months later, I saw the same patient, and found a fungating mass filling the whole vaginal vault.

But I have seen several, microscopically, that were earlier than these. It sometimes happens that the cervix, with or without the uterus, is removed for an unhealthy hæmorrhagic condition, which, whilst not accounted undoubtedly malignant, is yet so menacing in appearance as to make it wise to eradicate it.

I have a slide from such a case on which is mounted one of a great number of sections, of which all the others simply presented the signs of advanced chronic inflammation. This slide, however, shows that, at one point, there is a definite downgrowth of the thickened epithelium into a stratum of abnormal and newly-formed connective tissue, interposed between the elastic plexus and the basal epithelial layer. Opposite the apex of this downgrowing process, the elastic plexus is destroyed by a connective tissue cell pro-

liferation in advance of the epithelial cells. This is probably the very earliest stage of malignancy.

Some years ago, I had submitted to me a nodule, the size of a large pea, that had been removed for microscopical diagnosis. I cut the whole into several hundred sections. In one section, and one only, a similar appearance was observed. In view of the uncertain diagnosis that I, in my then state of knowledge, was able to give, the case was kept under observation for some months. At the end of that time, malignancy became manifest, and the uterus was removed. Knowing what I do now, I shall, when I next have such a case, advise immediate removal of the vaginal cervix.

The diagnosis of the disease in its initial stages must always remain a difficult problem, not only because of the uncertain and slight physical signs, but because the symptoms, associated with those signs, are equally indefinite.

All irregular losses of blood in a married woman over 35, no matter how slight, should receive immediate attention, and it is an urgent duty of the medical profession to educate the public in this matter, and to practise what they preach by immediately demanding a vaginal examination as soon as the patient comes to them, and, further, by refusing to treat with medicines any genital hæmorrhage of which they have not had the opportunity of investigating the physical basis.

The idea so firmly fixed in the lay, and to an extent in the medical, mind that the age period preceding the menopause is frequently associated with irregular hæmorrhages cannot be too strongly combated. The approach of the normal menopause is undoubtedly manifested by a steady lessening of the menses, both as regards quantity and frequency. When it is not so, some pathological lesion (not necessarily carcinoma, of course) is complicating the menopause, and should be at once inquired into.

But even immediate action on the part of both patient and doctor does not always solve the problem of early diagnosis, because of the slight and uncertain physical signs on which, in many cases, the diagnosis of carcinoma of the cervix, in its initial stage, has to be based.

There is only one absolute test in these cases : a thorough microscopical examination of the suspected tissue, not of one

section alone, but of a number of serial sections. Diagnosis founded on a single section, though usually sufficient, may be at times worse than useless. In pathology, a negative finding does not count for much, so that, in all cases in which the clinical signs point strongly to incipient malignancy, but the microscope says "not proven," I believe it is wise to treat it as an example of a border-line condition, and to excise the vaginal cervix.

As regards clinical signs, evidence of abnormal hæmorrhage from the cervix is by far the most important. Next to this, I would place the peculiar rough and friable feel, which the finger should at once detect.

The speculum, in my opinion, is the worst possible way to set about diagnosing carcinoma of the cervix. It may be taken that in a case in which a satisfactory diagnosis is impossible, on the first two points I have indicated, the speculum will not help further.

In particular, I look upon the tubular Fergusson's speculum as a most deceptive and dangerous instrument, for, owing to its shape, it compresses together the lips of a lacerated cervix so as to entirely conceal the state of their inner and opposed surfaces. It took me some time to understand how it was that, when my sense of touch told me advanced cervicitis was present, the Fergusson's speculum revealed nothing but two smooth pink cervical lips, without a trace of disease.

In short, we should learn to look as well as to feel with the end of our fingers, and where this "tactile eye" is unable to make a certain diagnosis, a thorough examination under an anæsthetic is the only course that should be entertained.

Passing to the diagnosis of the disease, when well established, it is obvious that the task is much easier. In most cases, it scarcely requires a medical man to know that the freely bleeding, rugged and hard, though friable mass that the finger impinges upon indicates serious disease.

Yet even in advanced disease, one occasionally meets cases in which the diagnosis is not easy. The anatomy of carcinoma of the cervix varies immensely. The two common clinical forms met with are the massive excrescence, and the deep rugged-sided excavation. These are easily recognised. There

are two other forms, however, in which the diagnosis is much more difficult.

The first of these is that where, in spite of an extensive growth producing great hypertrophy of the cervix, the mucosa covering its vaginal aspect is continued up to the very edge of the external os as an unbroken layer. The appearance of such a cervix, even when looked at under an anæsthetic, and with the vaginal vault well exposed, may be almost normal.

The second type is that in which the vagina is aged and shrunk, and at the top of it a small depression occupies the place of the vaginal cervix—a common feature in advanced senile atrophy of the genital canal. Blood is seen oozing from a small aperture in the apex of this depression, but no feel or appearance of growth is manifest.

These two types, the diffuse infiltrative form without ulceration, and the insidious atrophic senile form with no tumour formation at all, are worth remembering.

THE SURGICAL PROBLEM.

Finally, as to the surgical problem of carcinoma of the cervix, since, unhappily, at present the only possible cure is by surgery.

It is an interesting fact that though, from the mechanical point of view, the eradication of the disease is difficult, owing to the close proximity of the cervix to the bladder, ureters, and rectum, and the fact that the uterus can only be approached from a narrow passage below or through a deep hole above, yet, from the pathological aspect, the surgical problem is far more hopeful than is the case in carcinoma occurring in most of the other parts of the body.

The advance of a carcinoma takes place in two ways. First, by a gradual pressure destruction of the tissues surrounding it—"infiltration," and, secondly, by a growth insinuation along trunk lymphatic channels, styled "permeation" by Handley. Extension by infiltration is occurring all round the periphery of the growth, where a remarkably abrupt line separates the neoplasm from the tissues outside it, but extension by permeation is taking place only along certain definite lymphatic tracts, and is manifested by the occurrence of nodules in lymphatic glands and distant organs. So abrupt

is the edge of a carcinoma, even under the microscope, that, if the neoplasm advanced by infiltration alone, its permanent removal would be effected by an incision just beyond its abrupt macroscopic edge. But where growth by permeation is occurring, the ablation of the entire lymphatic tracts, up to and beyond the nearest chain of uninvolved glands, is necessary to render an operation likely to be permanently successful.

Now, an analysis of nearly 1,000 autopsies on these cases, carried out at the Middlesex Hospital Cancer Investigation Department, shows that, in no less than 55 per cent. of them, metastatic deposits, either in lymphatic glands or internal organs, were absent altogether—that is, the patients died purely as a result of their local disease.

Metastases, when present, were limited to the pelvic and lower abdominal glands in the larger proportion of cases.

In comparison with these figures, a similar investigation of cases of carcinoma of the breast showed that, of those dying of this disease, only 6·5 were free of metastatic nodules.

The tract of lymphatic permeation, in the case of carcinoma of the cervix, is a very simple and constant one, viz. : straight outwards through the parametrium and parametric glands to those situated along the external and common iliac arteries.

In the case of the breast, on the other hand, the usual lines of lymphatic permeation are much more numerous and complicated.

From the purely pathological standpoint, then, the extirpation of a carcinoma of the cervix should be an easier task than the complete removal of a carcinoma of the breast, and there can be no doubt that this would be so if it was not for the anatomical difficulties, surrounding the first undertaking, to which I have referred.

For the complete removal of a malignant growth extending both by lymphatic permeation and tissue infiltration, pathology demands an excision so planned that the line of incision should lie well outside the macroscopic edge in the regions where growth by infiltration is occurring, whilst in the regions of permeation it should extend sufficiently widely to embrace

the whole lymphatic tract into the region of uninvolved glands.

As regards the breast, these teachings have been generally accepted, and, under the guidance of pathology, the surgery of malignant disease in this organ has made great strides.

But their application to carcinoma of the cervix has come more slowly, and is not yet fully established, owing to the much greater anatomical difficulties which confront the surgeon. In this disease, the distinction between lymphatic permeation and tissue infiltration is well exemplified. Thus the bladder and rectum are involved by infiltration, a slow process, taking a year or more to cross the short distance between them and the cervix, whilst the much greater distance to the iliac glands may be spanned by lymphatic permeation in a few months.

For the establishment of an operation fulfilling the demands of pathology, gynaecologists are principally indebted to Wertheim, whose operation, or some modification of it, appears to me to be destined to become the only one practised for the cure of carcinoma of the cervix. This proceeding has been fully described by the author himself, whilst Comyns Berkeley and I have lately published our conjoined experience in detail (*Brit. Med. Journ.*, Oct. 3, 1908).

Its aims are three :—(1) To remove the uterus with the cervix enclosed by a capsule, formed by at least the upper third of the vagina, across the open end of which a clamp has been placed to prevent the escape of living cancer cells into the exposed tissues in the operation area ; (2) to remove in one piece, with the uterus, as much parametric and paravaginal cellular tissue and peritoneum as may be feasible ; and (3) to extirpate, after the removal of the uterus, as much of the remaining pelvic cellular tissue as may be possible, together with the parametric lymphatic glands and those along the iliac arteries.

The operation is a difficult one, of course, but its difficulties vary with the patient. Where the growth is advanced, and the patient fat, they become greatly increased ; but, in early cases, and in the absence of great obesity, it presents no difficulties beyond those which any surgeon skilled in this sort of work may not undertake with confidence.

The operation enormously increases the scope of surgery in dealing with this disease, and whereas, when vaginal hysterectomy alone was practised, only about 10 per cent. of the total number of cases presenting themselves were operable, it is now possible to deal with at least 60 per cent. For this reason, general statistics as to operative mortality should not be applied to individual cases, because amongst a number of patients operated upon are many in whom the disease was far advanced. Such as these, cachectic and debilitated by long continued loss of blood and toxic absorption, will always prove bad subjects; but, in earlier cases, whose vitality is sufficient to carry them through the immediate shock of the operation, there is no unpreventable reason why any of them should succumb.

But gratifying results are not limited to early cases. Indeed, the difficulty in giving a certain prognosis after operations for carcinoma is nowhere better illustrated. Thus, in March 1908, I performed this operation on a patient, who had been condemned as incurable, and in whom the disease had already excavated the entire cervix as far as the internal os. In January of this year, I examined this woman. Her cachexia had disappeared; she looked stout and well, and I could find no trace of any disease remaining in her. When one considers that the average duration of these cases, from the initial symptoms to death, is 21 months, and that this patient had, before she was operated on, already expended six of these, the bestowal on her of 9 months of health and hope has been a great gain.

My colleague, Dr. Comyns Berkeley, published last January the results of the first 30 of these operations that we have performed. Twenty-seven of them were performed last year, representing no less than 67 per cent. of all the cases seen by us in that period. Five patients died after the operation, and of the 25 cases that recovered, 18 are known to be free of recurrence at present; in 6 the growth has recurred, and 1 has been lost sight of. The time that has elapsed since the first case of our series was operated on (April, 1907) is so short that no deductions as to freedom from recurrence can yet be drawn. Wertheim's remarkable figures are well known, wherein, out of a very large number of persons recovered from the operation, no less than 60 per cent. were claimed to be free

of recurrence five years afterwards.

The mental attitude of persons afflicted with this disease has up to now been one of peculiarly distressing hopelessness. The fact that the operation, in offering to those that recover a chance of cure, brings renewed hope, and, even in the event of recurrence, a period of tolerable life, is not the least of its advantages.

The primary mortality of the operation is of course high. Out of over 200 cases performed in England, and collected by Comyns Berkeley,² it was 18 per cent. In our series, already referred to, it was 16 per cent.

An average mortality rate cannot however be applied to individual cases. Given a comparatively early and clean case, and there is no insuperable reason for any mortality at all. The operation has only been lately performed in Great Britain, but the percentage of recoveries already compares favourably with Continental figures. There can be no doubt that, with increasing experience and amended technique, the results will continuously improve.

¹ Hunterian Lectures, R.C.S., 1908, *Seventh Report of the Cancer Investigation Laboratories of the Middlesex Hospital*.

² *Transactions of the Medical Society*, January 25, 1909.



SOME POINTS IN THE TREATMENT OF SIMPLE FRACTURES, WITH AN ILLUSTRATIVE CASE.

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[With Plates VI.—VII.]

AT the present day, it is of vital importance for the medical man to be successful in the treatment of fractures. Recent events have shown that it is not enough for him to rely exclusively upon time-honoured methods, which he has found fairly successful.

In order to satisfy the demands of his own conscience, and to be above the reproach of an ungrateful public, he must be able to show that he has left nothing undone. For these reasons I venture to refer to a few practical points concerning the diagnosis and treatment of fractures.

(1) *Radiography*.—Every one knows the diagnostic value of the Röntgen rays in difficult cases, but I wish to urge their more common use for ordinary cases, for an exact knowledge as to the direction of a fracture, the nature and degree of displacement, etc., is of great assistance in the "setting." In some instances, the fracture can be set in the radiographic room, and the actual effects of the manipulations watched upon the screen. In others, this ideal method is not practicable, but in most cases, it is possible, even without removing the splints, to find out, by secondary screen examinations, if the reduction has been satisfactory, or if the fragments keep in apposition. Please remember that, to be depended upon, the examinations must be made in two planes at right angles to each other. Disregard of this obvious precaution has led to a great many mistakes, and has spoilt some reputations. It is hardly necessary to insist that medical radiographers are far more successful than those who have had no medical training.

(2) *Anæsthetics*.—When there is deformity, an anæsthetic is of great help in the reduction. Not only are the contracted

muscles relaxed, but the absence of pain and voluntary resistance on the part of the patient enable the medical man to do his work more thoroughly. I have had several fractures reduced without an anæsthetic, and I still have a lively recollection of the agony that I suffered upon one occasion without deriving much benefit.

(3) *The Importance of Early "Setting."*—The best time to reduce a fracture is as soon as possible after the accident, when the muscles are more or less relaxed from shock, and before blood exudes into the tissues and collects between the muscles and the bones, and, above all, before inflammatory changes occur in the soft structures around the fracture. All these changes, by shortening the "ties," increase the deformity, and add greatly to the difficulties of reduction. An anæsthetic can only overcome spasm, which is not the chief resistance in late cases.

(4) *Posture.*—In many cases deformities may be overcome by assuming postures which relax mischievous muscles.

(5) *The Value of Tenotomies in some Cases.*—Many of the well-known difficulties of treating Pott's fracture are due to the unbalanced contraction of the tendo Achillis and the posterior peronei. Hence the troublesome equinus, and increasing talipes valgus, that so frequently follow this terrible fracture.

The tendo Achillis may be partly relaxed by bending the knee, but division of the tendon is far better, because this also abolishes the powerful traction of the soleus.

In order to counteract abduction, the peronei may also be divided. No fear need be entertained that these tendons may not unite.

(6) *The Natural Shape to be copied.*—The ideal shape of a limb is that decreed by nature. For instance, the leg is curved with its convexity outwards. Yet the limb is often set "straight" after fractures of the tibia. The effect is that the lower fragment and the foot are abducted out of their natural positions. The result is shown in a limping gait. The weight falls upon the inner body of the foot, with the inevitable result of the development of talipes valgus and flat foot. Another instance is the rotation inwards of the lower fragment of the tibia upon the upper, which follows the use of the

vertical footpiece, and which Mr. Arbuthnot Lane has shown to be wrong.

In these matters, the opposite limb when sound should be our model.

(7) *Moulding*.—Please remember, that a considerable deformity may be corrected by moulding under an anæsthetic within the first ten days or a fortnight.

(8) *Splints*.—These should fit comfortably, and should not be left too long unchanged. Above all, they should not be too tight. Some allowance should be made for swelling, and this should be minimised by elevation of the part. Important vessels and nerves must not be compressed.

If attention is paid to these points, such troublesome complications as Volkmann's contracture, pressure sores, gangrene, paralysis, and chronic œdema may be avoided.

(9) *Massage and Movements*.—These are very valuable, especially if undertaken early, and carried out skilfully. By promoting the circulation of the limb, they hasten rather than delay union, if care is taken to prevent displacement of the fracture. A little movement does no harm, as shown in the ribs, which always join. Massage should be commenced as soon as possible, in order to hasten the absorption of blood and inflammatory effusions, but only slight movements, which cannot displace the fragments from apposition, are wise for a week or ten days. Slight movements, especially voluntary contractions, are quite enough to prevent adhesions of tendons. When the nearest joints are moved, the fracture must be well supported. After about ten days, the risk of displacement is slight, and more vigorous movements can be gradually undertaken. The splints should be loosened or left off for longer and longer periods every day to promote the circulation.

In these ways, chronic œdema, stiff joints, adherent tendons, weak muscles, and withered limbs may to a great extent be avoided.

(11) *Constitutional Treatment*.—In order to promote union, attention must be paid to the general health, the diet must be scrutinised, the possibility of scurvy or syphilis kept in mind, and moderate exercise encouraged. For many reasons it is not wise to keep these patients in bed longer than is absolutely

necessary.

(12) *Operations*.—I do not propose to deal here with fractures, which call for operation, such as those of the patella, olecranon, ununited fractures, and some oblique fractures of the tibia and fibula, and compound fractures.

The following case of mal-union, however, may serve to emphasise some of the points to which I have drawn attention.

A heavy lad, of 16, was kindly referred to me by Mr. Golding-Bird for operation for mal-united fractures of the left radius and ulna, with paralysis of the median nerve.

Seven weeks earlier the patient, while jumping, fell forward, the front of the left hand and wrist coming against the ground with considerable violence. He was in the country at the time, where the fracture was treated with anterior and posterior forearm splints for a month. Afterwards massage and movements were tried without avail.

When I saw him, at the end of June 1908, the left median nerve was completely paralysed below the wrist. The thenar eminence was wasted, and the fingers, supplied with sensory fibres from the median nerve, were discoloured and shiny.

The forearm was deformed, the hand and wrist being displaced backwards and outwards. Just above the wrist in front the skin was discoloured, and attached to the lower end of the upper fragment of the radius, which was prominent.

The fingers and thumb were flexed and could not be extended. The hand was prone, both active and passive supination being extremely limited.

Radiograms were taken in two planes and at right angles to each other (*vide* Figs. 1 and 2). These show the extensive overlapping and lateral displacement; and the striking prominence of the lower end of the upper radial fragment.

Operation.—On the 29th of June, the patient was anaesthetised by Dr. Trethowan, the forearm was raised, and a tourniquet was applied round the middle third of the arm. The ulnar fracture was exposed, between the flexor and extensor carpi ulnaris, which were retracted. The lower fragment was easily separated from the upper, by means of an elevator, the union being poor. Half an inch of it was then sawn off obliquely. The upper fragment was then isolated, with some difficulty, and a quarter of an inch of

PLATE VI.

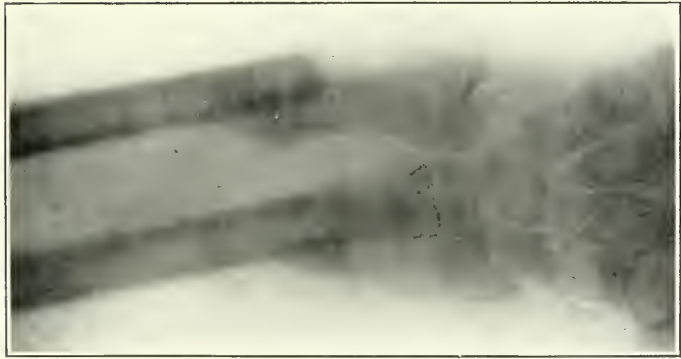


Fig. 1.—Showing overlapping, lateral displacement and callus.



Fig. 2.—Showing antero-posterior displacement and overlapping. Prominent lower end of shaft of radius injuring the tendons and median nerve. Full supination was impossible.

PLATE VII.



Fig. 3.—Rays passing antero-posteriorly.



Fig. 4.—Rays passing from side to side.

it was removed obliquely; so that the remaining extremities fitted accurately. Later on these were fixed in apposition by means of a plate with two screws. (*Vide* Figs. 3 and 4.)

The lower end of the radial upper fragment was exposed by a vertical incision over its prominence in front. The palmaris longus and flexor carpi radialis, which were adherent, were separated and drawn aside, exposing the median nerve, which was compressed and adherent to the inner side of the end of the upper fragment. Although it was slightly grooved at the point of contact it was not withered. It was of the same size below as above the construction. It was carefully separated from adhesions for $1\frac{1}{2}$ inches. It did not seem necessary to resect it.

The radius was more firmly joined than the ulna; and a great deal of superfluous callus had formed, especially on the postero-internal aspect of the upper fragment and towards the ulna. Some difficulty was experienced in separating some of the flexor tendons from the front of the upper fragment, and from the depression below this in front of the lower fragment. The tendons of the flexor sublimis digitorum to the middle and ring fingers, and those of the deep flexor of the index finger, were so damaged as to need resection. They were reunited with fine catgut sutures towards the end of the operation. About half an inch of the upper fragment of the radius was removed and the end thus left was shaped into a cone, and driven into a cavity made in the upper end of the lower fragment. (*Vide* Fig. 3.)

In this way, it became unnecessary to bury a plate or wire in the anterior wound in close proximity to a number of important tendons, whose movements it might impair. If it had not been for the obvious involvement of the median nerve and the flexor tendons, a posterior oblique incision would have been chosen as in a former case.

The periosteum, covering the front part of the upper fragment, was sutured to the upper border of the pronator quadratus muscle.

The ulnar fragments were then fixed together, and the wounds were closed. The forearm was covered with aseptic dressing, and firmly bandaged. The tourniquet was then removed, and the limb was fixed in an internal angular trough

splint, hinged at the elbow. A moulded pad was placed in front of the fracture and the wrist was flexed over this.

From the first the patient was encouraged to move the fingers voluntarily, and passive movements of them were adopted.

The wounds healed perfectly. After ten days the wrist was moved regularly, the forearm being firmly grasped at the site of fracture to prevent any movement between the fragments. Massage of the hand and forearm was also assiduously carried out. The bones were firmly joined five weeks after the operation. Both active and passive movements were rapidly increased, but some difficulty was experienced in extending the thumb and fingers to the full degree, and also in flexing them upon the metacarpals. Pronation and supination soon became easy. Very gradually the sensory and motor functions of the median nerve returned. Now, six months after the operation, the forearm and hand are normal in shape, and they are very useful but not yet perfect. The slight shortening is not noticeable.

My best thanks are due to Dr. C. J. Morton for the radiograms showing the conditions three months after operation, and to Dr. Trethowan for his untiring devotion during the after-treatment.

Remarks.—This case shows the great importance of examining nearly all fractures, or suspected fractures, by means of the X-rays. It also illustrates some of the dangers of the continuous pressure of splints, especially when some of the fragments are prominent.

An anæsthetic would have allowed a more complete reduction of the deformity in this extremely sensitive boy.

An operation became necessary on account of the deformity, the fixation of the flexor tendons, the almost complete limitation of supination, and the paralysis of the median nerve. All these conditions were improved by the operation, so that the limb is now both useful and shapely. It may be remembered that a little shortening of the upper limb does not matter, whereas in the lower limb it is more obvious and detrimental.

The condition of the median nerve did not call for resection ; it was enough to remove the pressure upon it.

The impaction of the upper into the lower part of the radius was useful. So far as I know, it has not been done before, except very successfully by nature in some cases of Colles' fracture. If permanent and more or less irritating foreign bodies can be avoided, we should endeavour to do without them, especially when dealing with the lower end of the radius, which is in such close relationship with a large number of important tendons and several nerve trunks. The shape of the lower end of the ulna is not suitable for impaction. The ulnar fragments can be kept in apposition by means of a plate, which fits nicely to the cutaneous surface between the extensor and flexor carpi ulnaris tendons. It may seem superfluous to remark that perfect asepsis is essential to the success of these bone operations.

The advantages of using a tourniquet, and of leaving it on until the dressings are firmly bandaged, are considerable. Not only is great deal of precious blood saved, but the absence of bleeding makes the operation easier, more accurate, and quicker. It diminishes the laceration of the tissues, and the infiltration of blood into them.

Very little bleeding can take place upon the removal of the tourniquet, after the dressings have been firmly applied, and the part elevated. In this way the risks of sepsis and œdema are minimised.

Early and persistent massage and movements are very important in the after-treatment. Voluntary movements are the most valuable of all.



PHTHISIS : ITS DIAGNOSIS AND TREATMENT.¹

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Diagnosis.—The early diagnosis is still difficult. First, the movement of the two sides of the chest must be carefully observed, and a difference between the two sides is easily detected, if the patient stands with his back towards his doctor with both arms hanging loosely, not one hand holding up the trousers. If he then takes a deep breath, one shoulder may begin to rise later than, and not rise so high as, the other. That side at once falls under suspicion, but it must be remembered that, in a right-handed person, the right side often moves a little better than the left. By placing his hands one on either side of the front of the chest, the doctor will at once note any difference in expansion.

Percussion does not, in the earliest cases, give a perceptible difference of note at the two apices, but myoidema, the node of muscle which springs up when the pectoral muscle over the ribs is sharply tapped with one finger, has several times proved useful to me in early diagnosis. In a few cases I have been able to obtain myoidema on one side only, and then there has always been phthisis on that side, in one case not detectable by auscultation till over a month later. When myoidema is obtainable on both sides, it is very suggestive of phthisis, but it may be found in any illness resulting in wasting, such as typhoid or rheumatic fever, cancer, leucocythæmia, etc. When signs of phthisis are present, myoidema helps in the immediate prognosis. If it is very marked, the phthisis is acute at the time, and if it cannot be obtained, though there may be signs of extensive excavation in the lungs, the disease is not progressive.

On auscultation of a normal chest, inspiration, and especially expiration, are louder at the right apex than at the left, but, in left-handed persons, the breath sounds are often louder at the left apex. The first sign of phthisis, before there is any detectable alteration in tone on percussion, or in vocal

¹ A paper read before the Brighton and Sussex Medico-Chirurgical Society.

resonance, is a diminution in the respiratory murmur at one apex. If this is found at the right apex, the diagnosis can be made, but, at the left apex, it is difficult to be certain that the diminution is more than the physiological difference between the two apices. While his doctor is listening to the apex, the patient should be made to cough, and then take a deep breath. Sometimes crepitations may, by this procedure, be elicited which will clinch the diagnosis. The next change is that expiration becomes bronchial in character, and vocal resonance is increased. The apices of the lower lobes of the lungs in the interscapular region should, in young people, be as carefully examined as the upper lobes, since, in rare cases, phthisis will progress in the lower lobe even to excavation without there being any signs at the apices proper.

The temperature, in the afternoon or evening, will, in an active case, be above normal, and will be raised after a walk or any exertion. The sputum should be examined for tubercle bacilli, but phthisis can often be diagnosed before bacilli appear in the sputum.

The latest aid in diagnosis is Calmette's Ophthalmo-Reaction. If a drop of a solution of 5 mg. of Koch's old tuberculin, in ten drops of sterilised normal saline solution, is instilled into one eye of the patient, if he is tubercular, the conjunctiva will, in a few hours, become red and swollen, and the eyelid oedematous, the inflammation lasting a day or two. This positive reaction implies tubercle somewhere, not necessarily in the lungs, but absence of conjunctivitis makes it practically certain that there is not early phthisis. In a few cases, the conjunctivitis has been very severe, and difficult to subdue, so that this test should not be applied, if there has been any previous eye trouble. In such cases, Von Pirquet's test is better. A few drops of 25 per cent. tuberculin are placed on a portion of skin rendered sterile, and then the skin is scratched through the tuberculin. If the subject is tubercular, a papule will arise in 24 hours, and remain for a few days.

Help can also be obtained by estimation of the opsonic index to tubercle bacilli. If it is found much above or below normal, tubercle is, in all probability, present somewhere. The result is more trustworthy if the index is taken the

morning after a day of exertion to catch a negative phase, and again, at the same time of day, after three days of rest, for a positive phase. If the former index is low, and the second high, there is tuberculosis, but, if there is not much difference in the indices, quiescent tubercle is not excluded.

In people above 40, with emphysema, a few crepitations can often be heard at the apices, on their taking a deep breath or coughing, which are due to emphysema and not to phthisis. There is no alteration in percussion, or vocal resonance, or in the breath sounds beyond the general weakening over the whole chest usual in emphysema; but there is an *emphysematous type of phthisis*, which occurs mostly in middle-aged men. The chest is in the position of inspiration, and often typically barrel-shaped; there is very little movement in respiration, which is mainly carried on by the diaphragm. There is wasting of the muscles and myoidema, but no flattening below the clavicles. On percussion, the note is hyper-resonant or drummy, except above the clavicles, where the note is often a little deficient. Breath sounds are weak over the fronts, and expiration is prolonged. At one or both apices, expiration is a little harsh or bronchial, and there are a few medium crepitations at the end of deep inspiration and more after coughing; the crepitations may be heard down to the third or fourth space. Vocal resonance is increased at one or both apices, and pectoriloquy may be heard. At the back there is definite want of resonance at one or both apices often extending below the spine of the scapula; respiration is bronchial, and sometimes cavernous in the region of the spine of the scapula, when no suspicion of it is heard in the front of the chest. Crepitations are usually more numerous behind, also in the upper part of the chest, and, at the base, there may be bronchitic crepitations or sibili. On examination of the sputum, tubercle bacilli are found. In such cases coming to the post-mortem table, more destruction of lung is found than is expected from the physical signs, emphysematous lung lying between the cavities and the chest wall. On the whole these cases do well, their age being above the average for the acute forms of phthisis. Pathologically most of them have extensive old fibroid tubercular lesions in the lungs as well as new deposits, and the emphysema is compensatory of

the destruction of lung in an old attack of phthisis, but some are due to tuberculosis implanted on chronic bronchitis.

Another type, which may cause difficulty in diagnosis, is the *acute broncho-pneumonic phthisis*, so fatal as a sequela of measles.

A. R., aged 14, was admitted to hospital on April 10. She had caught a cold in November, and had had a cough since, which had become very severe in the last three weeks. Her temperature was 102° on admission, and 103° that night; she looked very ill and was slightly cyanosed. Respirations 40. She was thin, the chest did not move well, and there was some retraction of the lower intercostal spaces in inspiration. On percussion there was good resonance all over, cardiac dulness normal. On auscultation, very numerous medium crepitations were heard all over both fronts and backs, but more numerous in the upper part of the chest in front and above the angle of the scapula behind. In places tubular expiration could be heard through the noise of the crepitations. The case was not unlike a very acute bronchitis, but a little sputum obtained was crowded with tubercle bacilli. The temperature assumed a high hectic course, 101° in the mornings, and 103° or higher in the evenings. In a month there was dulness down to the fourth rib on the right side, and to the third rib on the left, while cavernous breathing was heard on the right side from the apex to the fourth rib, and on the left to the third rib, with bronchial breathing to the fifth. Crepitations were very numerous all over, and were coarse over the cavernous areas. At her death, a fortnight later, there was almost complete destruction of the upper and middle lobes on the right side, and of the upper and half the lower on the left side, with caseous and grey tubercles scattered through the rest of the lungs.

Hæmoptysis.—There are two distinct forms, the hæmorrhage from a new active lesion, and that from the giving way of an aneurysm formed on an artery running in the wall of a cavity. Hæmoptysis from a new lesion is practically never dangerous, but it should be stopped as soon as possible, since the effused blood tends to damage other parts of the lung, and any large loss of blood puts the patient in a worse position for combating the disease. Where there are no physical signs, except a few soft crepitations at one apex, it is easy to be certain that it is hæmoptysis from an active lesion, but where there are signs of a cavity, it is very difficult to decide whether the blood comes from there, or from an area of crepitations at the other apex, or some other part of the lung. I have found the temperature a useful guide, where it is high and hectic, the blood is usually from a new lesion, and where it is only a little raised, the blood is more probably from a pulmonary aneurysm. These aneurysms are quite small, about the size of a pea, and

require careful search to find them post-mortem, but they are a frequent cause of death from hæmoptysis, and make the prognosis of late hæmorrhage serious. The treatment of hæmoptysis has not changed, except in the use of large doses of calcium chloride or lactate in order to promote clotting of the blood. Absolute rest in bed is essential, a hypodermic injection of morphia may be given in excitable patients; the best medicine is a mixture of sulphate of iron, sulphate of magnesia, dilute sulphuric acid, preceded, if vascular tension is high, by a dose of calomel, to keep the bowels loose, and increase the coagulability of the blood. Where the source of the hæmorrhage can be fixed, an ice bag applied constantly over that part of the lung is helpful.

Diet.—As regards diet, I am glad to see that there is a revulsion from the constant flooding with milk, which used to be considered the one food for consumptives. When I was at Brompton, almost every patient examined had a stomach splash extending well below the umbilicus; obviously their stomachs never emptied themselves, and there was more fermentation than digestion, hence it seemed better, in cases without much fever, to cut off the milk, and give digestive tonics, which caused the patients to eat more solid food, and evidently improved their condition.

When the disease is active and the temperature is high, milk diet is necessary, and the calcium salts in the milk are said to slacken the flow of blood through the tuberculous foci, and also tend to prevent hæmoptysis. As soon as the temperature is down to normal in the mornings, eggs and fish can be given with advantage for breakfast and lunch, while, in the afternoon and evening, milk is still best. Raw meat juice is a very useful addition, and when the temperature is lower, raw-meat sandwiches, the use of which was, I think, first suggested by Professor Lannelogue. I have wondered whether the natural serum in them contains anything antagonistic to tubercle bacilli, and whether raw horse, or goat, would give better results still, as they are less susceptible to tubercle than the ox.

When the patient is able to be up, three good solid meals with plenty of animal food, and careful attention to the

digestion, give the patient much more resistance than the old-fashioned milk régime.

Of medicines cod-liver oil in some form is very useful. During acute attacks, I give ammoniated quinine in a diaphoretic mixture. When there is little or no fever, creasote has appeared to me to give better results than guaiacol compounds, especially when the stomach is found dilated, then the creasote, given half an hour after meals, checks fermentation. The creasote, or quinine, should never be given within half an hour of meals, and, if there is no dilation of the stomach, not till an hour after, since they stop the action of pepsin as well as that of foreign ferments. A cough mixture is often necessary, and I fancy it is better that it should not contain squills. Digestive tonics are very useful at times.

As regards general treatment, it should be a fundamental law that no patient should be allowed out of bed until the evening temperature has been below 99° for a week, and that a return to bed should be made whenever it rises again above this limit.

There is not any doubt about the benefit of fresh air, and also of the sanatorium treatment. In the German State Sanatoria, of the first 80,000 cases treated, 60 per cent. were discharged fit for work, and half of these remained in full work for four years or more without relapse. The quality of the air makes a difference, some of the Swiss resorts, such as Davos, give better results than English places, and patients should stay out in Switzerland for the summer as well as for the winter until the disease is really quiescent.

Much the most important recent advance in the treatment of phthisis is that by *Graduated Labour*, originated by Dr. Paterson at the Frimley Sanatorium. The idea first suggested itself to him, when he saw a navvy with extensive phthisis none the worse for having worked hard nearly continuously for forty hours. He wondered if something could not be done to turn out working men from sanatoria in a fit and energetic condition, instead of in the slack, lazy, and fat state which has become usual. After three years of careful experimenting, he has evolved a definite system, of which the following is an outline.

First, a temperature in the mouth of 99° in men, or 99.6° in

women involves absolute rest in bed until the temperature has been normal for a week or ten days. He finds a lower limit of temperature necessary in men than in women, since in the latter a rise of temperature is more easily produced. Then the patient is allowed up for midday dinner, and goes to bed directly after, and gradually the time up is lengthened, provided that the temperature keeps below the fixed limit, until the whole day can be spent out of bed. Needlework and mat, or mop making, or some light hand work, are then allowed.

After being up for ten days, the patient walks half a mile a day for a week, and then gradually increasing distances not causing a rise of temperature until ten miles a day are reached.

Slight headache, malaise, loss of appetite are warning signs of too much exertion, generally preceding a rise of temperature, and must be taken to indicate the need for more rest.

When ten miles a day has been reached, the 1st Grade of labour is started. This consists in carrying a basket of earth weighing in all about twelve pounds fifty yards some eighty times a day, helping to build a reservoir. Gradually the weight carried is increased up to twenty-four pounds, then, provided that the temperature has kept normal, and all has gone well, Grade 2 is commenced. This consists of shovelling earth into baskets, or into a cart with a small spade, then Grade 3, shovelling earth into a cart with a full-sized spade, and, finally, Grade 4, pickaxe work or concrete mixing, which, increased to six hours a day, constitutes full work. After this, the patients are put for three weeks to work at their own trades, carpentering, and what not, and then discharged fit and strong.

Of patients discharged from one to two and a half years ago, who had been admitted with definite phthisis and tubercle bacilli in their sputum, 155 had been got up to the highest grade of work, and of these 135 are still at work, 9 are not at work, 2 are dead, and 9 have been lost sight of; nearly 90 per cent. at work a year or more after discharge, a result which must commend this line of treatment. He gives a liberal diet of ordinary food in three meals a day. Breakfast consists of bacon, etc.; dinner of meat, and suet or milk pudding; supper of soup, oat cakes, Cornish pasties, cheese, etc. Milk is not used except as it would be in their own homes. Practically

the only medicines used are aperients.

Dr. Paterson says that the most difficult period is that of the basket carrying, the transition from walking to work. Headache and loss of appetite precede a rise of temperature, and, if rest is not taken then, there ensue pains in the joints and limbs with higher temperature, attacks somewhat resembling influenza, and these are followed by pleurisy or hæmoptysis. The underlying principle of Dr. Paterson's success has been that he has induced just the right amount of auto-inoculation with tuberculin to produce the maximum opsonic response. He asked Dr. Inman to investigate the blood condition of his cases, and he found that, in 41 out of 43 cases examined, the opsonic index to tubercle was nearly always well above normal and never below, while in two cases, who had developed a temperature of 99°, the opsonic index was below normal, but this on rest, rose again to above normal. There had been an excessive negative phase from too much auto-inoculation. In the cases, which were on full work, some showed an opsonic index just normal, which did not vary with the hardest of work, the explanation being that the tubercular focus had become so quiescent that no tuberculin could be set free, even though a few tubercle bacilli could still be found in the sputum. It was also found that, by taking the opsonic index and judging by it, increased work could be given earlier in some cases, and so the duration of the whole treatment be shortened.

In explaining the theory of auto-inoculation, Dr. Inman says that Dr. Freeman, working in Professor Wright's laboratory on the opsonic index, in cases of gonorrhœal arthritis, found, by the effect on this index of massage of the affected joints, that "auto-inoculation follows upon all active and passive movements which affect a focus of infection, and upon all vascular changes which activate the lymph stream in such a focus." It is believed to be, by the agency of such auto-inoculation, that nature achieves curative effects in bacterial infections.

In active phthisis, auto-inoculations are constantly taking place, the opsonic index in the same case varying very rapidly. Professor Wright says the patients are living in a succession of negative and positive phases. It is very difficult to see

where tuberculin injections could be used with advantage in the acute stages, there is already too much inoculation going on, and Dr. Paterson's easy clinical method of regulating auto-inoculation seems much better. But in cases in which the temperature has become normal, but in which it becomes raised on the slightest increased exertion, the auto-inoculation is excessive, and in these the judicious use of tuberculin should improve the condition of the patient; also after late hæmoptysis, before it is safe to allow exercise, tuberculin is indicated. In those patients, who have reached the highest grade of labour, and who still have tubercle bacilli in their sputum, one might hope that tuberculin injections would get rid of these. Some doctors at sanatoria also say that, if a few tuberculin injections are given before the patient's discharge, there is less tendency to relapse.

In giving tuberculin, the best results will be obtained if the opsonic index is taken a few times first, and the New Tuberculin T.R. injected when the index begins to fall. After the injection, there will be a negative phase of a falling opsonic index for about 24 hours, followed by a rise to above the former line. A new injection is indicated when the index again begins to fall, which is usually in 7 to 10 days. Head-ache, rise of temperature, or a prolonged negative phase would show that too large a dose had been given, and a feeble opsonic response that the dose was too small. It is safest to begin with $\frac{1}{50000}$ th of a milligramme, slowly increased to $\frac{1}{10000}$ th or $\frac{1}{5000}$ th. It is possible to give tuberculin without using the opsonic index, if the temperature and clinical symptoms of the patient are very carefully watched, and the quantity injected is very slowly increased at intervals of ten days.

Dr. Latham, in a paper read before the Royal Society of Medicine last year, advocates the giving of tuberculin by the mouth in normal saline solution or in fresh horse serum. He says that it should be given when the stomach is empty and in the morning. He shows by the effects on the opsonic index that it really acts when so used, but the dose required is about double the hypodermic one. He claimed that benefit was derived from tuberculin even in very acute stages of phthisis, but this was not altogether confirmed by

Dr. Mackenzie, who saw several of the patients. The point, which struck me most, was the fact that fresh horse serum given alone always raised the opsonic index to tubercle without any preceding negative phase, and should, therefore, be a most useful addition to the treatment of acute phthisis.

When tuberculin is given in any form, the patient should be kept in bed for at least 24 hours, and the temperature taken every four hours, preferably in the rectum, in order to guard against ill effects during the negative phase.

He considers that Marmorek's serum is horse serum containing an unknown amount of tuberculin. This serum was tried some time ago at Brompton, but did not give such results as to make its use permanent.

Dr. Maguire's method of injecting intravenously every day 50 cc. of 1 in 2000 formic aldehyde in normal saline is difficult and expensive, but does good in some cases. In the only case in which I have used it it very much reduced the amount of sputum, and the patient certainly seemed better for it. Microscopically in the sputum the staphylo- and strepto-cocci were more reduced than the tubercle bacilli.

Cinnamate or hetol injections increase the number of leucocytes in the blood, and thus probably aid the phagocytic power. My own small experience of this method has not been very satisfactory, as I have only used it in very acute cases, and, though improvement has occasionally commenced soon after its use, in the majority of cases there has been no apparent effect.



HYPERTROPHY OF THE PROSTATE, AND ITS
OPERATIVE TREATMENT.¹

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UNDER the term hypertrophy of the prostate, are grouped a number of conditions, which may be conveniently classified as follows :—

- (1) Adenoma and fibro-adenoma.
- (2) Fibromuscular hypertrophy.
- (3) Fibrosis, or inflammatory change.

Of these, the adenomatous, or fibro-adenomatous, variety is by far the most frequent, and presents all stages of gradation between the rare condition, in which the tumour is almost purely glandular, to the common one, in which distinct areas of glandular proliferation are separated from one another by bands of fibromuscular stroma of varying thickness. A prostate of this nature is elastic, and often slightly nodular on the surface, on section it is seldom very hard, and frequently shows dilated acini, or minute retention cysts. Its surface usually presents a picture of numerous spheroidal tumours of different sizes, separated from one another by interlacing bundles of fibromuscular stroma. On microscopic section, the glandular elements are collected into lobules, the acini are dilated, and the lining epithelium shows varying degrees of proliferation, one, two, or more layers being present, and, in many cases, infolding or papillomatous ingrowth is marked. It is to this variety that all cases of marked hypertrophy belong. As the growth of the tumour progresses, the spheroids tend to fuse, and compress the surrounding normal prostatic tissue. In this way, a condition is reached, in which the centrally situated tumour is separated from the true prostatic sheath by a more or less attenuated false capsule, consisting of condensed prostatic tissue. This is of much practical importance from an operative standpoint.

The fibromuscular form of hypertrophy is of rarer occur-

¹ A paper read before the Leeds and West Riding Medico-Chirurgical Society.

rence, and never reaches the large size attained to by the glandular. On section, it is firmer, more homogeneous, and less succulent in appearance, and shows less evidence of spheroids and dilatation of acini. Microscopically, the stroma of connective tissue and muscle dominates the picture, the acini are regular in outline, and show less evidence of epithelial proliferation.

Under the fibrous, or inflammatory variety are grouped a number of cases in which prostatic symptoms, with partial or complete urinary retention, occur without any marked hypertrophy of the gland. The patients are frequently under the age of 55, and the obstructing agent is usually an inflammatory thickening of the group of glands about the vesical orifice, producing a bar or collar. This class of case is of much interest, as it may occur in comparatively young patients. There is no doubt that chronic prostatitis may lead to severe obstructive symptoms, large residual urine, complete retention, pain and discomfort without the presence of any palpable hypertrophy of the gland. Hugh Young, in a study of 145 cases of perinæal prostatectomy (*Johns Hopkins Hosp. Reports*¹), found four cases below the age of 50 years with marked symptoms, and nine cases between the ages of 50 and 54. All but one showed chronic inflammatory changes, and, in only three was there slight evidence of glandular hypertrophy. In the four cases younger than 50 years, the obstruction was entirely due to chronic inflammation producing a median bar.

Carcinoma of the Prostate.—Until recently, carcinoma of the prostate was considered to be a comparatively rare disease, but microscopic examination of prostates, removed by operation, has demonstrated that a considerable number of those, previously diagnosed as simple, were in reality malignant.

Exactly what microscopic findings should be termed carcinomatous is still a matter of debate. Albarran and Halle² claim to have discovered 14 cases in 100 specimens of apparently benign hypertrophy. In many of these, their diagnosis of carcinoma was based upon a somewhat luxuriant or papillomatous growth of the glandular epithelium. If their conclusion is correct, carcinomatous change, as a sequence of previously existing adenoma, must be common, for this

papillomatous proliferation of the epithelium is not infrequently seen. It probably, however, does not constitute malignancy, and Young, in a series of 250 prostates, removed with a diagnosis of simple hypertrophy, found only five in which undoubted malignancy was present, and he thinks that, in four of these, a diagnosis should have been previously made, on account of the stony hardness of the gland. On the other hand, he states³ that, during the five years preceding 1908, he saw 250 cases of simple hypertrophy, and 68 cases of undoubted carcinoma, the proportion between carcinoma and simple disease being greater than one to four. If he were to include as malignant, cases such as Albarran describes, the proportion would be still greater.

It is probable that carcinoma of the prostate is only rarely implanted upon a previously existing adenoma, and, in most cases, is a process which starts *de novo*, and rapidly infiltrates all parts of the gland. Young and Geraghty,¹ in a careful microscopic study of 120 specimens, found only one case in which an area of malignancy was present in an otherwise benign hypertrophy. However this may be, carcinoma of the prostate is a common but slowly progressing disease; it rarely breaks through the posterior capsule of the gland, and involvement of the vesical mucosa is a late happening. The chief direction, in which spread occurs, is to the vesiculæ seminales and the space between them. If, in a case of prostatic obstruction, the gland is of stony hardness on rectal examination, giving no sense of elasticity to the examining finger, and, if further a zone of infiltration is felt in the region of the vesiculæ, the diagnosis of carcinoma is in most cases correct.

OPERATIVE TREATMENT.

Much discussion has arisen as to the exact nature of the operation of "enucleation" of the prostate, but it now is generally admitted that, in the majority of cases of adenomatous hypertrophy, the line of cleavage is not between the gland and its true capsule, but between the adenomatous mass and the compressed and flattened remains of the unaltered portion of the gland. In the fibromuscular and inflammatory forms, the separation, no doubt, occurs mainly between the gland and its capsule, and, as can be imagined, this operation

is one of great difficulty, and, in a large proportion of cases, is impossible, without the aid of scissors.

There are two routes by which enucleation of the prostate may be practised; the suprapubic, which is the operation generally adopted in this country, and by an increasing number of surgeons on the Continent and in America; and the perinæal, which is extensively practised in America, and particularly by Hugh Young of Baltimore.

In considering the claims of the two routes, several questions must be taken into account:—

1. The facility of the operation.
2. The conservation of important structures in relation to the prostate.
3. The thoroughness of the operation.
4. The operative risks and sequelæ.

With regard to facility of removal, there is no question that, in the ordinary form of adenomatous hypertrophy, its enucleation by the bladder route is infinitely easier. In the fibromuscular and inflammatory types, in which no line of cleavage is present, both routes are extremely difficult, and, in some of these cases, the perinæal route is preferable, for the necessary use of scissors can be practised under observation.

2. The conservation of important structures in relation to the prostate. It is claimed, by the advocates of the perinæal route, that in this way the prostatic urethra and ejaculatory ducts can be maintained intact.

So far as the ejaculatory ducts are concerned, it is a matter of opinion whether their preservation is of very great importance, but if their rupture can be avoided in any way, it should certainly be striven for.

When sagittal and cross-sections of the prostate and urethra are compared, it is evident that the larger proportion of the gland lies anterior to the ducts—the portion termed by Albarran the pre-spermatic group of glands; it is from this group that adenomatous tumours usually arise. In the suprapubic operation, the plane of enucleation is anterior to the ducts, which are separated from the adenomatous mass by a thin layer of compressed tissue, and they will, in most cases, be preserved, the only portion in which they are likely to be injured being at

their termination at the verumontanum.

As regards the preservation of the urethra, in the suprapubic operation, a portion at least of the prostatic urethra is usually sacrificed. In some cases it may be possible to enucleate adenomatous tumours occupying the lateral lobes individually, leaving the whole of the urethra, or its superior wall, but, in the larger proportion of cases, the lateral lobes are removed, united together by a portion of the anterior and posterior commissures, and bring with them the thinned and stretched urethra clothing their internal surface. If the stripping of the anterior extremities of the lobes is carefully accomplished, the urethra will tear across, in a large number of cases, behind the position of the verumontanum, in other cases, particularly in the fibrous variety, in which enucleation is difficult, and much force has to be used, the urethra is liable to tear farther forward, even as far as the membranous portion.

If a number of prostates, removed suprapubically, are examined, it is seen how thin the urethra is, and how intimately it adheres to the tumour, and one wonders how, by the perinæal method, the separation can be made with sufficient delicacy to leave the canal intact. Albarran¹ denies that it is possible, and, when performing the perinæal operation, deliberately leaves a portion of the gland in contact with it. Young, on the other hand, maintains that it is possible, and, from the detailed reports which he gives of his cases, one is bound to admit that it appears to be so, in his hands at any rate.

The removal of a portion of the prostatic urethra, in the suprapubic operation, appears to be followed by no untoward results, probably on account of the rapid growth of the epithelium covering the vesical and urethral mucosa, so that the preservation, or otherwise, of the urethra, provided that the rupture does not occur too far forward, is a matter of academic rather than practical importance.

In respect of the third point, the thoroughness of the operation, it has already been said that some surgeons deliberately leave a portion of the gland on the urethral aspect, when operating from the perinæum, but there are two other important points to be considered, namely :—

The presence of a median lobe or bar, and the presence of vesical calculi.

By a median lobe is understood a collection of adenomatous

tissue, either pedunculated or sessile, on the posterior lip of the vesical opening, and, by a bar, a narrow dense band of prostatic tissue uniting the lateral lobes, but projecting only very slightly into the cavity of the bladder. Whichever condition is present, it not infrequently is a more important obstructive factor than the enlargement of the lateral lobes, and the operation is incomplete unless it is removed. By the suprapubic route, there is no likelihood of such a lobe or bar being overlooked; by the perinæal method, however, unless the operator is extremely familiar with the use of the cystoscope, and clear demonstration of the various aspects of the prostate is admittedly one of the most difficult feats in cystoscopy, there is a risk that a median bar may be left behind with incomplete relief of symptoms.

The detection of a vesical calculus by other means than the cystoscope is often difficult, when the prostate is enlarged, and the exaggerated dorsal position, employed in perinæal prostatectomy, is liable to make one fall away from the base of the bladder, where it might be felt by the prostatic tractor during the operation.

An incomplete operation is more likely to be done, therefore, by the perinæal route than by the suprapubic unless a routine cystoscopy is performed by an expert.

With regard to the operative risks and sequelæ, it may be said that, in expert hands, the immediate and remote risks are comparatively small, when one considers the advanced age and weakly condition of many of the patients, whilst, in the hands of the less expert, the suprapubic operation is much less likely to be followed by untoward results. The perinæal entails a risk of wound of the rectum or subsequent sloughing of its anterior wall with the unpleasant sequence of recto-vesical or recto-urethral fistula.

The direct mortality of the two operations, as published by their greatest advocates, is as follows:—Freyer,⁵ up to 1907, had performed the suprapubic operation in 432 cases with 29 deaths, a mortality of about 7 per cent. Young,³ on the other hand, at the end of April, 1908, had performed the perinæal operation in 273 cases with 8 deaths, a mortality of 2·8 per cent., and, in the last 146, there was only one fatality. Young's cases include many with evidences of severe

renal infection, and he quotes, in the greatest possible detail, the histories of the first 145 amongst which all but one of the deaths occurred. There is no evidence that cases have been selected and unfavourable ones refused, and one can express nothing but the greatest admiration for such a record, which is infinitely superior to any statistics yet published with regard to either method.

The commonest causes of operative death are :—

1. *Shock*.—This is rarely pronounced, for the operation is not usually prolonged. Young states that, in his cases, it was only severe in three, who were all over the age of 75, and in all spinal anæsthesia with cocain was employed. It is probable that the symptoms were due to the cocain rather than to the operation. He employs subcutaneous infusion of normal saline as a routine procedure, during or immediately after operation, and to this and the exaggerated dorsal position ascribes the freedom from shock.

2. *Hæmorrhage* from the prostatic bed, either primary or secondary.—The primary hæmorrhage is usually easily controlled by lavage with hot saline solution, and, if excessive, can usually be stopped by gauze packing ; the latter procedure should, if possible, be avoided, as it encourages sepsis. The French surgeons employ pressure upon the prostatic cavity between two fingers, one in the bladder, and the other in the rectum for several minutes, and this might be tried before resorting to packing. Hæmorrhage is most difficult to control in the fibrous prostates which require much force for their removal of the use of cutting instruments. Secondary hæmorrhage is the result of sepsis, and may be avoided.

3. *Pulmonary Complications* are not common. The age of the patients, and the weak condition to which they are frequently reduced, are important factors in the supervision of bronchitis, or hypostatic pneumonia. To obviate this, patients should be propped up in bed as soon as possible, and in many cases they can get up into a chair in three or four days. Pulmonary embolism has caused death in a few cases.

4. *Uræmia*, or actual suppression of urine, may be the cause of death. In almost all such cases, more or less pronounced symptoms of uræmia have been present before operation (hiccough, anorexia, dry tongue, etc.). By a careful

preliminary treatment, relief of bladder distension by regular catheterisation, lavage, or an operation *à deux temps* if urinary infection is present, much can be done to relieve the effects of renal back pressure, and diminish this operative risk. After operation, subcutaneous infusion and the administration of large quantities of fluid by the mouth are of the utmost value.

5. *Sepsis*.—In a condition, which is frequently associated with infected urine, septic complications, subsequent to operation, are not infrequent, and although they may not, in the majority of instances, be sufficiently severe to place the patient's life in jeopardy, they always materially influence the rapidity of the convalescence. They are apparently more likely to occur in the suprapubic than the perinæal operation, and suppuration may arise in the abdominal wound, and the retropubic cellular tissue, or in the cavity from which the prostate has been removed. For their avoidance, certain details should be observed. In the first place, in bladder surgery, as much care must be taken in aseptic technique as in operations on other parts of the body.

In cases in which no previous bladder infection is present, no preliminary lavage is employed, but, in all cases, for two days before operation, the patient is made to drink large quantities of fluid, and is given urotropin gr. x. three times a day. In cases in which cystitis is present, the bladder is washed out once or twice daily with considerable quantities of sterile salt solution; this must be done with the greatest gentleness, particularly in cases of long standing.

With regard to the method of bladder drainage after removal of the prostate, most surgeons differ in minor details, but I have a decided preference for the method described by Moynihan,⁶ namely, fixation of the margins of the bladder wound by a single silkworm gut suture on either side, which passes through the abdominal wall, and closure of the upper and lower extremities of the wound in the parietes by sutures, which approximate the recti muscles. No drainage tube is inserted into the bladder.

An alternative method is to close the incision in the bladder tightly round a drainage tube by means of catgut sutures, and connect its outer end to a receptacle for the urine.

The advantages of the no-tube method are that clots are

more easily evacuated, there is no tendency for the wound edges to become sloughy from pressure, I believe that the subsequent wound closure is more rapid, and no sutures are left in the wound to be absorbed (I have in mind two cases, in which a temporarily healed suprapubic wound broke down to discharge an infected catgut suture with re-establishment of the urinary fistula). The dangers of sepsis in the retropubic space do not appear to be any greater, if stripping has not been carried too far, and the muscles are afterwards approximated.

The obvious disadvantage of the no-tube method is that, for two or three days, the patient's dressing has to be frequently changed, but I think the advantages outweigh this.

As soon as possible after operation the patient is encouraged to drink freely of fluid, the urotropin is continued and combined with 30 gr. Ac. Sod. Phosp. per day, which is given well diluted. On the second or third day, the bladder is gently washed out through a Jacques catheter introduced by the urethra until all clots have been evacuated. I have not seen any fresh hæmorrhage of moment excited by this. The urethra should be washed out before introduction of the catheter into the bladder and after its withdrawal. On the fourth day, the stitches holding the bladder are removed, and a Colt's apparatus applied. My first experiences with this ingenious appliance were not very successful, and I blamed the apparatus, but, with more practice, I have found it of the greatest possible use, and I see that my early failures were due to my own clumsiness. By its use the patient is kept perfectly dry, and there is no hindrance to the closure of the wound. The dressing can, as a rule, be kept quite watertight for about a week, and, during this time, the bladder is washed out daily. Suprapubic drainage is admittedly somewhat imperfect, and there is a tendency for a pool of stagnant urine to collect at the base and in the prostatic pouch, although the latter cavity rapidly contracts; this must be remembered in washing out, for, if the catheter is introduced far into the bladder, it is possible for clear solution to be issuing through the wound, whilst this pool remains practically untouched. For this reason, and also to avoid injuring the healing surface, the catheter should be passed to a point only just beyond the compressor urethræ. If this precaution is taken, the various ingenious instruments

designed to enable a perinæal drain to be inserted through the prostatic pouch, will, I think, be found unnecessary.

As soon as the Colt's apparatus becomes loosened, or sooner if the wound shows signs of rapid closure, a soft rubber catheter is tied into the urethra, the precaution being taken that it only just enters the bladder, and so drains it efficiently. The edges of the wound are also drawn together by strapping.

The catheter should not be retained for more than 48 hours consecutively, but, at the end of that time, should be withdrawn, the urethra well flushed, and the catheter readjusted after careful sterilisation. The risks of epididymitis are, in this way, diminished, and the bladder may be drained per urethram, until the suprapubic wound is completely healed, which usually occurs during the third week, sometimes much earlier. With the most scrupulous cleanliness, regular lavage, and attention to detail, I believe that, in at least 80 per cent. of cases, normal micturition will be established in the third week.

As regards subsequent progress, the results are in most cases perfect; for a few weeks many patients suffer from rather frequent micturition (every 2 or 3 hours). This is usually due to slight bladder contracture, the result of drainage, but is in most cases rapidly recovered from if the patient will make an effort to hold the urine as long as possible. In a large proportion of cases, it can be held for from 4 to 6 hours within 5 weeks of the operation. I have not seen a case of stricture resulting from prostatectomy, although, in one case, the inability to pass a gum elastic catheter suggested its presence, the difficulty was, however, due to a slight irregularity in the urethral floor, for a full-sized silver catheter passed with ease, when assisted by a finger in the rectum. Young states he has seen no case of stricture following the perinæal operation, although he has had a similar experience to the one mentioned.

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CEREBRO-SPINAL FEVER.

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THE following notes were made after a careful study of 40 cases under my charge at Leith Public Health Hospital. All had their diagnoses confirmed by either post-mortem or bacteriological examination.

The disease has been called by many names, but I think that cerebro-spinal fever is the best, though, to be correct, it should be called epidemic posterior basic meningitis.

ÆTIOLOGY.

The active causal agent is the diplococcus intra-cellularis meningitidis or micrococcus meningitidis cerebro-spinalis, first described by Weichselbaum in 1887. It may be briefly described as being in shape and size very similar to the gonococcus, occurring in pairs of two hemispheres with the flat surfaces opposing, but may also be seen singly or occasionally in tetrads. It is said to sometimes form chains, but I have never seen them. It is actively motile, but no flagellæ are visible; often a distinct capsule may be seen. It stains readily with ordinary stains, but does not retain Gram. It is grown with difficulty and has to be subcultured every two days to keep it active.

Predisposing Causes. Season.—Winter and spring are the months in which it is most prevalent, as a rule; though not invariably, as in some instances it has begun in the middle of summer.

Age.—In my own cases, 72·5 per cent. occurred under 15 years of age, and 50 per cent. between 5 and 10 years. Only one case was under 12 months. In this, as in nearly all the other infectious fevers, children are most commonly attacked.

Occupation.—In adults, soldiers, young recruits on active service especially, are chiefly affected.

Injury to the Head.—In only one instance had I a case in which an alleged injury appeared to be really connected with the onset.

EPIDEMIOLOGY.

In the first place, is it infectious? In the epidemic form it is now generally recognised to be so. The actual degree of infectivity apparently varies, at times being very great, at others, as at the end of an outbreak, being quite insignificant. In support of the non-infectious theory is the fact that there have been no school epidemics and that cases can be nursed in the general wards of an infirmary. The absence of school epidemics may be explained in two ways. First, that it may not be infectious in the initial stage. Secondly, that the onset is usually so definite that the child either never goes to school ill, or is at once sent home, and has no time to infect the other children. Nurses and medical attendants have been attacked while attending to cases in hospitals. Leichtenstern¹⁷ gives instances of a sister and three nurses contracting the disease while in the cerebro-spinal wards.

A most striking and conclusive example of infection is furnished by Dr. Hare. His assistant attended a friend, and sat up with him for 40 hours, till he died. In less than 24 hours after, he himself was attacked, and succumbed within 24 hours. Dr. Hare, who attended him, suffered, two days later, from a severe headache and stiffness of the neck, with slight temperature, but, luckily, nothing more serious resulted.

As well as being directly infectious, the disease is also transmitted through a third party or intermediary.

There are numerous instances of this, but none more conclusive than Jehle's¹⁹ in Silesia. He noted, what had already been commented on, that cases, which had occurred in rapid succession in point of time, were often separated by distances that excluded direct infection. He then found that the children, who were infected, belonged to fathers all working in one particular mine; that the children of fathers in neighbouring mines escaped. He concluded that the mine was the source of infection, and the fathers the means of dissemination. His idea was that, in the infected mine, the meningococci flourished in most suitable conditions for their growth, namely, warmth, darkness, and moisture. They would easily be inhaled and get into the nasal passages and throats of the miners, who, going home, would spit on the floor, and so scatter the organisms, and the children, while grubbing about, would

become infected. In this way, two or three cases might occur in one house, yet would not be due to contagion from an infected case but to infection from a common source through a healthy intermediary. Following up this idea, Fraser and Comrie²⁰ tried to discover a common source in the Leith cases. This was not an easy undertaking, but they found a ship in which the fathers of five families that had contracted the disease were working. On exposing petri plates in the ship, meningococci were obtained. The fathers had presumably infected their families, though they themselves had escaped.

Four cases of my series were children of four of the five fathers working on the infected ship mentioned above, and one of these is worthy of special notice, because he slept with his father, whereas the rest of the family slept with the mother, and they all escaped.

Briefly, then, the disease in epidemic form is infectious, and frequently transmitted by an intermediary who does not necessarily contract the disease.

What is the Portal of Infection?—At present there are two alternative theories—

1. The alimentary tract offers the portal by means of food infection.

2. The organism is air-borne, and inhalation is responsible.

The former is strongly upheld by Fowler.¹² He says, that there is no clinical or pathological evidence to prove that there is any course of infection from the nasal passages, but "there seems to be certain facts, tending to show that, in cerebro-spinal meningitis, the cord lesion is primary, and that the diplococcus invades the nervous system through the spinal meninges." He then goes on to say, "In most cases the post-mortem findings show that the cord lesion is of older standing than that of the brain. The constant early and complete abolition of the abdominal reflex seems to point to the implication of the lower dorsal cord." He further supports the theory, by comparing pneumococcal meningitis, which is primarily cerebral, with meningococcal. In the former, in one case, in which lumbar puncture fluid was clear, the abdominal reflex was present, but, in two of the latter, when the fluid was turbid, and the cord therefore implicated, the abdominal reflex was absent.

Now there is both pathological and clinical evidence to prove the existence of a course of infection from the nasopharynx. In the first place, in Flexner's¹⁰ experimental work he found "that, if the dura mater, beginning at the olfactory bulbs surrounding the olfactory nerves, and extending through the cribriform plate into the nose, is carefully removed, with the adjacent portion of the ethmoid bone and olfactory mucous membrane, fixed in Zenker's fluid, sectioned longitudinally, stained in hæmatoxylin, or methylene blue and eosin, and examined microscopically, the passage of leucocytes from the brain cavity into this membrane and about the olfactory nerves towards the ethmoid can be traced." If, then, there is a passage in this direction, there must be one in the reverse way from olfactory mucous membrane to dura mater. Further he states: "The abundant lymphatics of the mucous membrane are in communication with the lymphatic spaces which enclose the branches of the olfactory nerves, and these again communicate with the subdural and subarachnoid spaces of the cranium . . ."

Direct infection from the nasopharynx is, therefore, possible, and the most probable.

For the food infection theory, this delicate organism is expected to run the gauntlet of the gastric juices and then to migrate, by some means, to the spinal column. One cannot conceive this as being possible unless a pure culture were swallowed, instead of the few meningococci that might conceivably have become attached to the food. In the inhalation route, on the other hand, the few organisms inhaled have a most suitable ground in the warm, dark, and moist nasopharynx to settle and increase in numbers, before their absorption or migration.

A very definite example of meningeal infection by inhalation is mentioned by Councilman.²² A pathologist, while working with meningococci, suddenly acquired a severe rhinitis with congestion of the mucous membrane and profuse mucopurulent discharge. At the same time, he had a severe headache and retraction of the neck. Examination of the nasal discharge demonstrated the presence of meningococci.

How can the theory of primary implication of the cord be reconciled with a purely cerebral case? I have never

found a report of a purely spinal case, whereas purely cerebral ones undoubtedly are not uncommon.

The loss of the abdominal reflex, upon which Fowler lays stress, is not constant. Its absence may be explained by the profundity of the toxæmia. Of my 40 cases, the reflex was absent in 19 cases, present in 13, not noted in 8. Of the 19 the toxæmia was marked in 18, but of the 13 in which the reflex was present, only one was profoundly toxic. In two of my cases on admission when little was noticeably amiss, the reflexes were present, but as the toxæmia supervened they disappeared.

Further, supposing the food of a family were infected, one would expect to see two or three of the children attacked at the same time, but whenever two cases have come under my observation from the same house there has been an interval between them.

How is Infection introduced into a District?—It must be admitted there are always present, in any district, sporadic cases of cerebro-spinal fever, *i.e.*, posterior basic meningitis. When, therefore, an epidemic occurs, it is not a question of the introduction of a fresh disease, but the increase in virulence of the organism—as McDonald puts it—the organism commonly exists in an attenuated form, possibly in the nasal secretions, which, increasing in virulence, gives rise to posterior basic meningitis, or, getting still more virulent, produces cerebro-spinal fever.

A parallel is seen in the case of pneumonia. One not infrequently encounters quite a serious epidemic, but it is still pneumonia, and is not dressed up with a new name; yet it must be due to the same causes as in cerebro-spinal fever, *e.g.*, increase in the virulence of the pneumococcal organism. One is frequently struck by the close resemblance of these two diseases both in this point and in many others, chief of which may be mentioned the following:—

The degree of infection and contagion. They frequently complicate each other, and cerebro-spinal fever is also complicated by other inflammations, of which pneumococcus is the cause. Their onset is similar, and in both the severity of the constitutional disturbances is quite out of proportion

to the local lesions. Both show a high leucocytosis with the onset, which increases with the severity of the attack, and diminishes with improvement. Both frequently have an associated herpes. Apart from the gramstaining and shape, the organisms present many resemblances. Both are difficult to grow, their growths are not unlike, and both cause a suppurative meningitis, and, in some instances, have been found together.

Incubation Period.—Netter gives between 3 to 11 days. In my series it seemed to be about from 5 to 10 days.

Immunity.—A few cases are on record of second attacks. Councilman, Mallory, and Wright have found five such cases.

SYMPTOMS.

Prodromal symptoms do occasionally occur. Five of my cases showed them, the following being an example. Seven days before the actual onset the patient felt cold, shivered, and complained of headache, pain in the back, and she vomited. For the next week she played about with the other children as usual, but on the seventh day the headache returned, and in a few hours she was unconscious.

The onset is a noteworthy feature, usually being strikingly sudden. This was seen in quite 25 per cent. of my cases, and in 72.5 per cent. the patients were thoroughly "down" with the disease under 24 hours from the onset of the first symptom. It is the abruptness of the initiating symptom which is so striking. The two most commonly seen first are headache and vomiting. The former is not of the usual type, but very acute, sometimes excruciating, and most difficult to relieve. It was only definitely absent in three of my cases. Vomiting is almost as frequent and is spontaneous, without previous nausea. Convulsions occasionally initiate the disease. Shivering, not a definite rigor, was noted in nearly 50 per cent. of the cases. Following the headache, pain in the neck occurs, and this may later continue down into the back. Rigidity of the neck early appears, and may be frequently seen in exaggerated form as head retraction. This rigidity I lay stress on, owing to its being almost constant. It was only absent in two of my cases, and diagnostically is of much more importance than head retraction as it occurred in 95 per cent.

as against 55.

The temperature (*see* charts) is characterised by its variability. In chronic cases it remains irregularly high for about

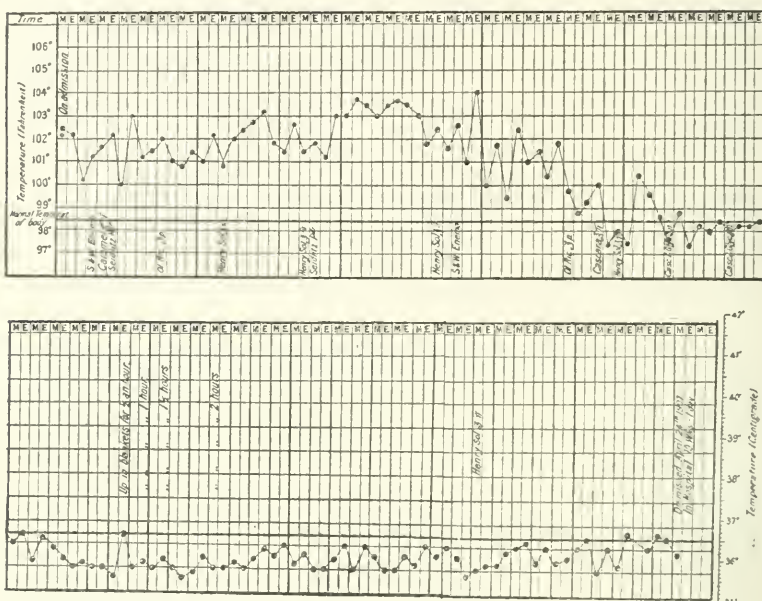
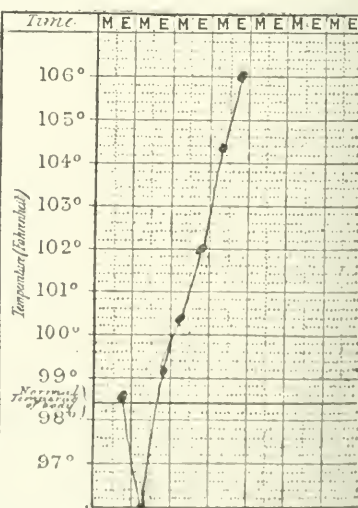
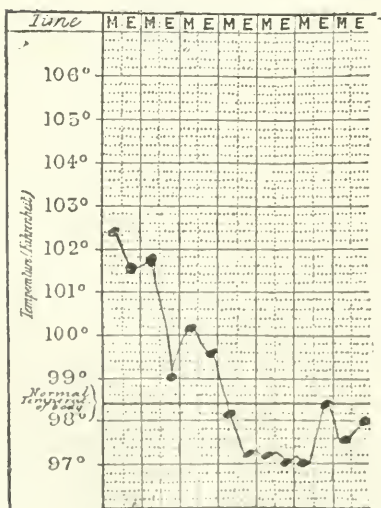


Fig. 1.—Typical chronic case ending in recovery.



Figs. 2 and 3.—Two acute cases both ending fatally.

three weeks, then descends by lysis. It does not always ascend again before death, so that a subsidence of temperature does not necessarily signify a good prognosis. The pulse and respiration may vary as much as the temperature, and quite independently of it and of each other. Usually both are increased in rapidity.

The decubitis in over half of my cases was lateral, with the legs drawn up and knees and elbows fully flexed. This position is due, apparently, to the head retraction. Some cases will only lie on one side, refusing to be turned on to the other in spite of the most painful bedsores, which seem impossible to prevent in spite of every precaution.

The purpuric rash I saw present only in 27·5 per cent. When limited in extent, the chest and upper half of the abdomen are the chief sites, but, in pronounced cases, it appears over all parts of the body and extremities. The spots vary in size from 1 to 5 or 6 mm. in diameter, have irregular but sharply defined edges, and are of a purplish colour, not disappearing on pressure. Herpes, usually labial, I obtained in 30 per cent. Other eruptions consisted of erythemata, urticarial rashes, and in one case a bulbous eruption. In a few cases, on the extensor surfaces of the elbows and knees and strictly limited to the region of the joint, a pin-pointed red purpuric rash appeared. The *tache cérébral* was only present in 19 cases.

The restlessness is a very common symptom, is frequently marked, and sometimes extreme. I have seen a patient, lying on her left side, toss herself right over to the right, and on to the floor. In this stage, they are indifferent to the bruising which results from hitting their arms and legs against any thing that comes in the way. All cases are, of course, not so severe as this, many simply toss about mildly in bed.

The facial expression is of pain, even though the patient is unconscious. The face is frequently flushed. This is a cyanotic flush, bluish-pink in colour. Ormerod says the face is usually pale: this is so in the later stage of chronic cases, but very unusual in early acute ones. Unconsciousness varies from a state of stupor, from which they may be easily roused, to the extreme state of coma; or there may be a muttering delirium, the patient chattering quietly and incessantly.

Emaciation is noticeable in any case that is protracted.

There is undoubtedly a smell characteristic of the disease, as is also found in diphtheria, typhoid, and other of the infections. I can only describe this smell as being exactly the same as that which pervades a blanket which has been washed with a lavish supply of black or soft soap, and which has not been properly rinsed out. I have therefore termed it a "soapy smell," and it was present in just over 50 per cent. of my cases.

In the nervous system, there is little loss of muscular power in the early stage of the attack, except that, owing to the stiffness in the neck, and pain on attempting to rise, the patient cannot sit up. In the later stage, general weakness accompanies emaciation.

Hyperæsthesia is frequent, and was present in about half of the cases. The localised hyperæsthesia over the spine, mentioned by Osler,⁴² I only found once.

Kernig's sign was present in only 24 cases and was more often in children than adults. The tendon reflexes are quite irregular: they may be exaggerated, normal, or absent. I obtained a definite jaw jerk seven times, and in one case a well defined jaw clonus. Babinski's sign was present seven times, but only in children. Aphasia occurred in two cases, both of which were fatal. The pupils were as irregular as the reflexes, except in chronic cases, where they became dilated.

Deafness I noted four times, twice in cases that recovered, but the deafness remained. In all it was bilateral and absolute.

In the alimentary system:—The tongue, in half my cases, was coated with a brownish fur, the surface was dry and cracked, the edges often raw-looking, and the papillæ were sometimes prominent.

The majority lost the appetite during the acute stage, to regain it as the more severe symptoms subsided. Some of the chronic cases had no desire for food, and even objected to it for weeks. In the acute stage thirst was very distressing. Vomiting, which was frequent, was, in many cases, accompanied by a good appetite. Seven cases were unable to swallow. At first, they regurgitated part of the food through the nose, but later nothing at all could be swallowed. This difficulty is due, I consider, to the presence of marked head retraction. In these cases, nasal feeding, or gavage, had to be resorted to. One case had a definite and severe hæmatemesis.

Constipation was the rule, and was often of a very obstinate nature. Loss of control of the sphincters was present in the acute cases, and in the chronics, when they became very emaciated and weak. Hæmorrhage from the rectum occurred in one case. Tenderness of the abdomen on palpation was present in nine cases.

In the respiratory system, 55 per cent. showed the presence of congestion of the throat. In one case there was a definite pseudo-membranous yellowish exudate on the tonsils. These were only enlarged in two cases. In three cases a thick purulent discharge from the nose occurred.

Pulmonary trouble was rarely present at the onset, but, in some cases, undoubtedly, hastened a fatal termination. Bronchitic and bronchopneumonic signs were observed in 16 cases. Cheyne Stokes' respiration was only twice present.

The examination of the urine :--The reaction was always acid. The specific gravity varied from 1028 to 1042. Albumin was present in 14 cases, *i.e.*, 35 per cent. In 10 of these it was only as a trace ; in three, the quantity varied from .2 to 11.4 grains per ounce. Sugar was present in three cases. A deposit of urates was common. The diazo-reaction was invariably negative, and was of great use in diagnosing from typhus. The estimation of urea was not consistently carried out, but, in the few cases in which it was done, the quantity was under the normal.

THE BLOOD.

I was able to make an examination of the blood in 32 cases, though, unfortunately, in only 23 did this include a differential leucocyte count. The counts were made as soon as possible after admission, though some were delayed as long as 48 hours. They were taken before food, to avoid digestion leucocytosis. The results are shown in Table II.

Leucocytosis, which has been the chief point in the blood noted by all previous writers, was very evident, ranging from 13,125 to 62,500 per cmm. ; that is, excluding the third count of Case 5, which was taken two weeks after admission, when the acute symptoms were subsiding. The average count was 24,700, and 56 per cent. were over 20,000 per cmm. A fairly high leucocytosis is, I consider, the most favourable to find. The average count of cases that died under one week

was 18,545, whereas, on the contrary, two cases, with counts as high as 62,500, were fatal.

The low count designates a feeble resistance, the high count a profound invasion. Probably the best count prognostically is one of about 25,000, which I look upon as signifying a moderate invasion with a good resistance.

The next noticeable feature is the high count obtained of the red corpuscles, and the corresponding high percentage of hæmoglobin. Taking 5,000,000 per cmm. for a male, and 4,500,000 per cmm. for a female, to be the normal, no less than 21 of my cases exceeded it. The colour index is high, being, in the majority of cases, over 1. No nucleated red corpuscles, no poikilocytosis, and no alteration in the size of the red cells were noticed in any case. Looking at the differential leucocyte counts, one is at once struck by their variability. Taking the following figures, which I quote from Cabot, as representing the normal :—

Polymorphs	-	-	-	62 to 70 per cent.
Small lymphocytes	-	-	20	„ 30 „
Large „	-	-	4	„ 8 „
Eosinophiles	-	-	$\frac{1}{2}$	„ 4 „
Mast cells	-	-	4	„ 8 „

My table shows the polymorphs to be somewhat in excess, generally at the expense of the lymphocytes, which only figure between the normal given in five instances. Another noticeable feature is the absence of eosinophiles in a great number of the cases. Cabot says they disappear in the early stages, to reappear later. In all instances in which the glycogenic or iodine reaction was tried, a negative result was obtained. Briefly summarised, then, the results of the blood examination in the early stage presented the following conditions :—

1. A high red count.
2. A pronounced leucocytosis.
3. High percentage of hæmoglobin.
4. High-colour index.
5. Polymorphs in excess.
6. Diminution of small lymphocytes.
7. Absence of eosinophiles.
8. Negative glycogenic reaction.

LUMBAR PUNCTURE.

This I did on 37 cases, of which 35 were successful, the other two being "dry taps." The method of procedure I shall describe in detail. The following are required:—

1. Needle and stylette.
2. Pressure gauge.
3. Test tubes.
4. Syringe that will fit the needle.
5. Thoma-Leiss pipette for counting the cells. That used ordinarily for white corpuscles is the best.
6. The diluting fluid for 5—*e.g.*, a 0.3 per cent. solution of acetic acid coloured with methyl green.
7. Glass capsules of eudrenine 0.5 c.c. size.
8. Hypodermic syringe for injecting 7.

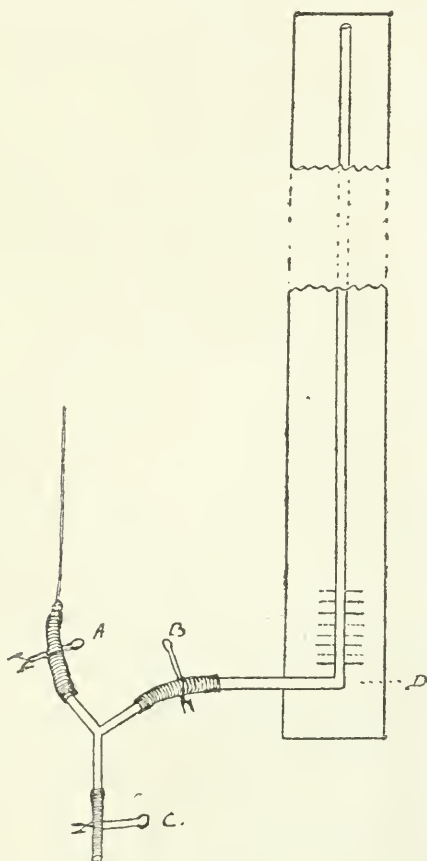


Fig. 4.

9. Collodion.

10. Swabs and small quantity of cotton wool.

11. Stimulants in case of collapse.

The needle selected should be a 3-inch, fine bore, platino-iridium, one with a short sharp point. These details are important. Needles are often supplied too short. The metal should undoubtedly be flexible. I have seen the rigid ones used as a routine, and have tried them myself, but there is no comparison in the feeling of safety when using the flexible needle, when the patient suddenly arches back his back. A broken needle in this site would be most awkward.

Then, too, why use a large bore? It is supposed that the fluid, when very turbid, will not flow through a fine one. This is a mistake. It certainly does not flow so fast, but it can always be got through a fine bore, and the patient is far less disturbed. The outside measurement of my needles is only one millimetre in diameter. The point should be short, so that it does not bend if it touches bone.

The pressure gauge, that I used, was of a simple, if somewhat cumbersome type. It consisted of a scale 85 cm. long, graduated in centimetres. Attached to this was a fine glass tube, ending at the bottom in a right angled bend. The capillary error was then measured and found to be 1.5 cms. The glass tube was therefore fixed to the scale so that the lower end commenced 1.5 cms. below the beginning of the graduations. This permanently allowed for the capillary error, so that the reading was taken direct. The gauge was attached to the needle by a short rubber tube in which was inserted a three-way glass tube, and a short rubber tubing was fixed on the third arm of this. A clip was fixed on each arm of the rubber tubing. The whole presented the appearance seen in the diagram. In using it, the needle is inserted with the rubber tubing attached to it, in order to avoid any unnecessary discomfort to the patient by attaching it with the needle *in situ*. Clip A. is then closed and attached to its arm of the three-way glass piece. The level of the lowest part of the glass tube D. is then brought to the level of the needle. With clip C. shut, clips A. and B. are opened, and the fluid runs up the tube till it finds its level. The pressure may then be read off directly in cms. Clip A. is then closed, and clip C. opened, so allowing the fluid in the glass tube—a very small amount—to be collected. Clip B. is then closed. The scale may then be either detached or kept on, to take a second pressure reading at the end of the operation. Clip A. is opened, and the fluid collected.

The method of judging pressure, according to the flow of fluid from the needle, is most inaccurate. Case 31, for instance, recorded a pressure of 56 cm., yet the fluid only ran in very slow drops, and, in Case 34, only 2 c.c. could be collected after patient waiting, the fluid coming in most dilatory drops, yet the pressure was 77 cm. Conversely, in Case 25, though the fluid spurted out as if under very high tension, the pressure was only 27 cm.

We are now ready to follow through the operation.

The patient should be placed on his side, left side preferred, with the knees drawn well up, and head bent well forward, so as to arch the spine as far forward as possible in order to give the greatest amount of space between the vertebræ. Should a local anæsthetic be used? It is not necessary but to be strongly recommended. Since I started using eudrenine I would never do it without. .5 c.c. is almost painlessly injected, and in three minutes' time the anæsthesia is perfect, allowing the needle to be deliberately and accurately inserted, with a minimum of disturbance to the patient. It is also far more comfortable for the operator; there is no crying or sudden jerking on the part of the patient. The pressure, too, is much more accurate on account of the absence of crying.

All the needles, syringes, etc., must be perfectly aseptic, and the skin sterilised thoroughly.

The needle is inserted in the third lumbar space. The level of this is obtained by drawing a line joining the crests of the ilia; this line passes through the required space. A very good guide is to draw the line actually with a skue pencil to within an inch or two of the spine on either side. One can seldom go wrong when this is done.

Having found the space, a point about $\frac{3}{8}$ to $\frac{1}{2}$ an inch from the middle line on the upper side is then selected, a trifle below the mid point of the interspinous space, and the anæsthetic injected.

The lumbar puncture needle now follows through the puncture made in giving the anæsthetic. It is directed forwards, inwards, and a trifle upwards. When about $1\frac{1}{2}$ inches from the surface, there is sometimes an obstruction and a false impression that the point is right in. By tilting a slight amount either up or down, one can feel the way in past this, and the point enters the spinal meninges with an unmistakable feeling, as if the resistance had been suddenly removed. If no fluid now escapes, insert the stilette. Frequently this clears away any slight obstruction. If still no fluid escapes, attach the syringe prepared (No. 4), and gently draw out the piston. A small clot of pus is often drawn through the needle in this way, and an uninterrupted flow permitted. I think this simple manceuvre should diminish many of the "dry taps" recorded. If, however, in spite of

these precautions, no fluid is obtained, the explanation is probably that the theca has just been missed: withdraw a little, and point more towards the middle line. If still unsuccessful, withdraw altogether, clear the needle, and repuncture.

The pressure gauge may now be attached in the manner I have described. The level will be seen to fluctuate with the respirations and pulse; if it does not, the needle is probably partially blocked. The reading should be taken as the mean of the highest and lowest level. The fluid is next collected in the test tubes which are ready. While this is being done, the fluid should be drawn up into the Thoma Zeiss tube for the cell count. This is usually done after the operation, the fluid being taken from the test tube. I consider that greater accuracy is assured by using the fluid that is flowing from the needle. The amount of fluid drawn into the pipette must be varied according to the cloudiness of the fluid, more of a clear looking fluid being naturally taken than of a very turbid one. The count can be made in the ordinary way, and the dilutions calculated.

How much fluid can be collected? This depends entirely on the case. The only rule to go by is to stop directly headache is complained of. For ordinary diagnostic purposes, 10 cc. is ample.

I have found 13 cases of a fatal result after lumbar puncture (Gumprecht⁴⁷ and Ossipow⁴⁸), but the danger seems to be greatest in cases of cerebral tumour. In order to guard against accident, the patient should always be in the horizontal position, fluid should never be aspirated, and the operation should be stopped immediately the headache is complained of.

The fluid when obtained should be centrifuged, and the clear fluid examined chemically for albumin and reducing substance. Films should be made of the deposit, for the examination of the cells, and for the presence of meningococci.

Before proceeding it would perhaps be as well to give an idea of the normal characters of cerebro-spinal fluid. It is perfectly clear and watery, with specific gravity of 1003 to 1004 (Kopetzky⁴⁹). It is faintly alkaline, and contains albumin in quantity less than half gram per litre (Rous⁵⁰). Warrington⁵¹ says a trace of reducing substance—not sugar

—is present, and Emery⁵² is most emphatic about this point as a diagnostic aid ; he says it is always diminished or absent in meningitis. Foster⁵³ says the substance is pyrochatechin. The pressure has been estimated at widely different figures, from 40 to 60 mm. by Dana and Hastings,⁵⁴ to 70 to 300 mm. by Rous. The normal number of cells appears to be about 0 to 2 per c.mm.

The results obtained from the present cases are shown in Tables III. and IV. The amount of fluid obtained varied from 2 to 42 c.c. In character it was turbid, or very turbid in the majority of cases, often looking like thin watery pus. In 23 instances it was like this ; in 7 only slightly turbid ; nearly clear in 2 ; clear in one, and bloodstained in one. In a case that is recovering, the turbidity gradually disappears.

The pressure was, unfortunately, only recorded in centimetres in the latter half of the cases, the earlier ones being judged by the manner of flow from the needle. In the latter 16 instances where it was noticed, however, it varied from 8 to 77 cms., and averaged 48 cms., excluding the second record of Case 32. This shows considerable increase of pressure.

From the cell count, I had hoped to obtain some useful information, but the results were disappointing. In Flexner's experiments, after inoculation into the peritoneal cavity of monkeys, the greater the number of leucocytes exuded the greater was the resistance. I thought, therefore, that a high count would indicate a high resistance and favourable prognosis. This is not the case. Taken alone, and also in conjunction with the leucocyte blood count, I could discover nothing but discrepancies.

Case 25, with L.P. count of 143,750, recovered ; yet Case 34, with count of 97,344, died in 3 days, and Case 12, with only 9,370, recovered. Similarly, Case 23, with L.P. count of 35,750, and blood count of 18,750, survived, whereas Case 26, with corresponding counts of 34,320 and 21,840, died in 4 days.

Speaking generally, a high L.P. cell count and a high leucocytic blood count are co-existent. Whether they appear in large or small numbers will depend on the individual resistance and the virulence of the infection.

The actual figures show an enormous increase from the normal, ranging from 780 to 143,750 per c.mm., the average

being 36,945 per c.mm. (omitting second counts) for the 22 cases in which the estimation was made.

The differential count, which was made from stained films of the deposit from the test tube, shows the polymorphonuclear cells to be greatly in excess.

In estimating the albumin, I used an ordinary Esbach tube. This method is coarse, but gives comparative results, and is simple. Rous uses a tube similar to Esbach, but with a small bore. He suggests that a solution of phosphotungstic acid in hydrochloric acid would be a better reagent than Esbach. The results show that it is always greatly in excess of normal, but it varies considerably. In every case there was an entire absence of any reducing substance. This quite agrees with Emery's statement referred to above.

Meningococci were present in every case, except Nos. 33 and 30. They were gram-negative in all instances, but one—Case 8. They were usually both intra- and extra-cellular.

They are said to disappear early in the disease but I have found them present on the 32nd day, and Fowler³⁶ says they have been found as late as the 90th day. Conversely, Elser reports negative findings in three fatal cases, 24, 14, and 9 hours before death.

The results on the whole were disappointing. The facts established were: the increase of pressure, the great turbidity of the fluid, the high cell count, the high proportion of polymorphs, the increase in the amount of albumin, the absence of reducing substance, and presence of meningococci.

Clinically, the severity of the attack was indicated by the percentage of polymorphs, but this can be judged equally well without a lumbar puncture. No fact determined by the puncture was of any prognostic significance. Fowler says that very turbid fluid, swarming with organisms, is unfavourable. Cases 17 and 25 were marked examples of the state of the fluid, but both recovered.

In Case 33 the fluid, on the other hand, was very slightly turbid, and no meningococci were seen, yet the patient died.

COMPLICATIONS.

In the nervous system, the most frequent is hydrocephalus in some degree. Definite dilatation of the ventricles was seen post-mortem in 4 out of 15 cases, but, besides these, there were

instances where symptoms of it being present were observed clinically. The idea generally held is that it is due to closure of the foramen of Majendie. This cannot be correct, because, if it were so, we could not relieve it by lumbar puncture. I do not say that the foramen may not be occasionally occluded, for it has been found post-mortem to be so, but it is conceivable that, in these cases, the occlusion has occurred subsequently to the hydrocephalus. I consider that the real cause of the hydrocephalus in these cases is due to inflammatory hypersecretion of the cerebro-spinal fluid from the pia, which is forced up into the ventricles. Unless it is very pronounced, it is often difficult to diagnose it early, whereas it is important to do so. There is a better chance of a good recovery if relieved early, and, moreover, it is one thing in cerebro-spinal fever that can be definitely relieved. Koplik⁵⁷ lays great stress on the importance of McEwan's sign, *i.e.*, a tympanitic note on percussion of the skull. I must confess that in no case was I ever able to elicit it. The variation in the note seemed so fine, even in a definite case of hydrocephalus, that one imagined that it had been obtained when one wanted it. This is, of course, useless to be of diagnostic value, and I think for ordinary, everyday use we must still rely on the clinical evidences of increased intracranial pressure.

Of other complications in the nervous system, those affecting the ear are the most serious. Colles⁵⁹ goes so far as to say that one-fifth to one-sixth of the cases of acquired deafness is due to cerebro-spinal fever, and that most deaf-mutes owe their defect to an attack of the disease in infancy. Four of my cases became completely deaf; two recovered from the disease, but the deafness remained. Acute otitis media is not very uncommon, but rapidly subsides without impairment of hearing.

The most common eye complication that I had was conjunctivitis, which occurred seven times, and, in one case, was very severe. Strabismus was present in four cases. Of others that do occur may be mentioned choroiditis, keratitis, and perforation of the anterior chamber (Lesynsky), iridocyclitis with separation of the retina, and neuritis.

Next to the nervous system, the respiratory is the most important, pneumonia and bronchopneumonia being the most

serious of the fatal complications; besides these, pleurisy, congestion, and cedema occurred in my cases.

Of other complications, I had few examples: one developed tabes mesenterica during convalescence, and arthritis occurred in one case in the right elbow.

Prognosis.—There is no doubt the prognosis is very serious. A mortality of 75 per cent. speaks for itself. Nevertheless, individually, no case at the outset should be despaired of. The actual severity of the symptoms counts for nothing. Only two out of my eleven cured cases were mild ones, the other nine were clinically very severe. The one fact observed in my cases that was of prognostic value was the onset and its character. A sudden invasion was invariably followed by a fatal result. By this I do not mean the sudden onset of the first symptom, for this may be strikingly sudden, yet the patient may, for the next 24 hours, not be fully "down" with the disease. In all my cured cases, the onset was noticeably less severe than the others. Some of my worst cases recovered, whereas others, apparently recovering, died, and the case least ill of all, with the shortest and most mild attack, died. This was a case that illustrates a point not generally recognised, that some which recover, die suddenly at a later date. Flexner had examples of this with his experimental monkeys, and the cause of death was unexplained post-mortem. The duration is most variable; acute cases may live only a few hours, whereas chronic ones may linger on for eight to ten months.

Diagnosis.—The diagnosis of cerebro-spinal fever, during an epidemic, with a well-marked case, and with the aid of lumbar puncture, is not particularly difficult. In the early stage, however, it often is exceedingly difficult to be positive.

Lumbar Puncture is the most useful aid to diagnosis that we possess. It is simple, and when properly done is a perfectly harmless procedure, the examination of the fluid, for diagnostic purposes simply, is rapidly performed, and one which any practitioner may easily do himself, but, even if he does not do so, a bacteriological and cytological report may be quickly obtained, which will at once establish the diagnosis of the disease, if present. By it one may first discover whether meningitis exists at all. This may be determined by the quantity of cells present, the increase of albumin and absence

of reducing substance. If meningitis is found to be present, then the nature of it may be discovered by the cytological or bacteriological examination. Excess of lymphocytes signifies tubercular meningitis, excess of the polymorphonuclear variety, cerebro-spinal fever, or pneumococcal meningitis. The determination of the organism present, if found, further clears up the exact nature of the disease.

Kernig's sign is of very much less value, in fact I doubt if much reliance can be placed on it at all. It is often absent, and, further, may be present in other forms of meningitis, or when no meningitis exists at all. It may be found in typhoid, pleurisy with effusion, hysteria, vertebral rheumatism, sciatica, and many chronic nervous diseases. The neck rigidity should always be felt for, it is most characteristic.

It is of course in the initial stages where the greatest difficulty occurs. The onset may simulate almost any of the infectious diseases, but of these typhus bears the greatest resemblance. I had three cases sent in as typhus that were cerebro-spinal fever, and two sent in as the latter which turned out to be typhus. The first cases seen in London, in 1865, were pronounced by Murchison⁶² to be closely allied to typhus. Though there are many points of resemblance, the onset in typhus is not so severely abrupt, the temperature is very characteristic, with its rapid rise, maintenance, and subsidence by crisis, the face is much more congested and suffused, leucocytosis is slight or absent, and the urine gives a beautifully positive diazo reaction. Scarlet fever may be mistaken for cerebro-spinal with its sudden onset of vomiting and headache, especially with a slight sore throat, but the illusion should not be long lasting. Influenza, commencing suddenly, may perfectly mimic the disease for the first few days. Tubercular meningitis is more insidious in its onset, causes less headache, and the cerebro-spinal fluid is cytologically characteristic.

When seen late, a chronic case will often be regarded as one of typhoid. Several times I had Widal examinations to do for practitioners, who, on the receipt of a negative result, performed a lumbar puncture, and forwarded characteristic meningococcal cerebro-spinal fluid. Of other diseases which

came under my notice for differential diagnosis were pneumonia, tonsillitis, uræmia, and gastro-enteritis.

As to posterior basic meningitis, this I consider to be the sporadic form of cerebro-spinal fever. A careful study of the account of posterior basic meningitis, as given by Barlow and Lees,⁶³ reveals no noticeable differences, excepting minor details, the chief of which is that of age. In the sporadic, or mildest form, only children under two years, or the most susceptible and of least resistance, are attacked, whereas, during an epidemic, when the virulence is increased, what is more natural than to find the age period broadened? The symptoms, pathological changes, and the cerebro-spinal fluid in the two diseases are all similar, and the diplococcus seems to differ only in its viability. Still now holds that they are the same organism. Clinically, too, the two diseases are indistinguishable.

TREATMENT.

Prophylaxis.—The public health authorities, during an epidemic, should take the necessary steps to add this to the list of notifiable diseases, and render all possible aid to the visiting physician in any instance where cerebro-spinal fever is suspected. The system in New York is perhaps the most perfect. The Health Department supply outfits, which may be obtained at certain drug stores throughout the city, for forwarding specimens of cerebro-spinal fluid to them. These are examined and the result telephoned to the physician. If the latter does not feel able to do the puncture himself, he may call in from the Health Department a special medical expert to do it for him, or to otherwise assist in diagnosing the case. This having been arrived at, it is at once notified.

When a case occurs, it is always advisable to have it isolated either in hospital, or, if circumstances permit, at home. In the latter case, two good nurses will be required, for the work entailed is exceptionally heavy. All contacts should be removed to a reception house for at least one night, so that the house may be thoroughly sprayed, and every stitch in it removed for proper disinfection. While at the reception house, the contacts can have their clothing disinfected, and their throats and noses syringed with some antiseptic, a weak

solution of formalin being probably the best. Whether treated at home or in hospital, the nurses should be as careful in keeping their hands frequently cleansed as in typhoid, and should gargle the throat with some antiseptic before going off duty. Soiled linen should be disinfected. Children, who have been in contact with the case, are better kept from school for 10 days. Considering the high mortality, these precautions are well worth observing during an epidemic. With sporadic cases, during a quiescent period, they may be relaxed somewhat, owing to the infectiousness being so much less.

General.—The room should be large, well ventilated, but warm, and quiet. The patients, except where the bath treatment is employed, should be sponged over at least twice daily with hot water. Hot bottles will be required in plenty to keep the patient warm. In the later stages, the greatest care is required to prevent bed sores. A daily evacuation of the bowels is desirable, if possible, but is often not easy to obtain, when the obstinate constipation, so common in this disease, is present. Nourishment may be given by small quantities of fluids in the acute stage, but later, the greatest care must be exercised to combat the rapid emaciation without overtaxing the digestion. Forced feeding, by either nasal or stomach tube, must be resorted to when food is refused, or unable to be swallowed. Water may be given freely, and is constantly asked for. Alcohol is avoided by some on the ground that it is a brain stimulant, but I found that in small quantities it was often beneficial. An ice cap, or ice applied to the nape of the neck, is strongly recommended. Osborne says:—"The ice cap to the head and special ice bag are, I believe, very necessary, and especially an ice bag to the back of the neck is of positive value. I keep up these ice applications more or less constantly. . . ." If the temperature is subnormal, he uses dry hot applications. I discarded ice entirely in favour of hot applications, as the latter gave such infinitely better results. In patients sufficiently conscious to tell the difference, the hot application was always preferred, as giving greater relief. It is required at the nape of the neck.

Hot Baths.—This simple measure is undoubtedly the most effective. I used them at a temperature of 107° to 110° F.,

immersing the patients for from 10 to 15 minutes. The manner of action is, I think, to relieve the congested membranes by withdrawing the blood to the superficial capillaries. Why chronic cases should obtain so much benefit from the baths I do not understand; they should be more useful to acute ones. Such was not my experience. While acute cases obtained much temporary relief, so much so that they would cry out for them to be repeated, the chronics permanently and visibly improved, and it was this class of case that most forcibly brought out the usefulness of this method of treatment. The acute cases obtained relief from their pain, and obtained a good quiet sleep after the bath. The chronics, however, were encouraged to kick and splash about, and so obtained splendid gentle exercise. The headaches were relieved and became less constant, their appetites, nutrition, and muscularity improved, and they became less peevish. I consider that there is no single remedy we possess of such value as the regular and frequent use of the hot bath. Three immersions in the 24 hours are, as a rule, sufficient, though if possible, in some cases, four hourly ones would be preferable.

Drugs.—First and foremost, above all others, must be mentioned morphia. This must be given in liberal doses, and can be done fearlessly, as even children appear to acquire great tolerance of the drug. Quinine I also found of value in the early acute stage, though it is said to be contra-indicated, as being a cerebral stimulant. Ergot I tried but with no beneficial results. This may be due to the manner of its administration. I gave it per mouth, whereas it appears that, in order to obtain the best action, it must be given intramuscularly, or deep subcutaneously.

Stimulants will be required often and continuously. Strychnine should be avoided.

In the convalescent stage, besides tonics, potassium iodide is of undoubted value. Other drugs have been used. Seibert⁶⁶ recommends sodium salicylate given in large doses per rectum. Five cases were treated, and all showed a marked improvement. The first case was given grs. xv. every hour for 10 doses, the subsequent cases had grs. xv. every six hours until 150 grains had been given. In a tubercular case, it was also tried, but no improvement was noted.

Intravenous injections of 4 cc. twice a day of mercuric chloride 2 parts, sodium chloride 9 parts, in distilled water up to 1,000 parts, is another remedy well spoken of. Mercuric chloride has also been recommended, given in hypodermic injections along the spinal column. Saline injections given per rectum, or subcutaneously, were found beneficial by Ievers and Elder. They gave a soothing effect to the nervous system, and stimulated the heart.

Lumbar Puncture.—It was as a therapeutical measure that Quinke originally introduced this operation in 1891. It was done in a child of two years to relieve a recent hydrocephalic effusion. Recovery was complete after three punctures. The indication in this case was obviously increase of intracranial pressure. This is the one and only indication for a lumbar puncture to be of any use therapeutically, but when done for this reason the benefit obtained is assured. The headache ceases, as does also the vomiting; stupor, or coma, is lessened, and the patient distinctly improves, at any rate temporarily. I never saw any improvement after it had been done in an ordinary case, but I cannot but think that the removal of fluid so purulent, as it often is, containing probably thousands of meningococci, must be beneficial. The remaining fluid must become diluted by the secretion of fresh fluid, which may also be accompanied by more active phagocytic leucocytosis. The toxicity will thus be reduced, and destruction of the remaining meningococci aided.

Spinal Medication.—Chipault⁶⁷ was the first to replace the cerebro-spinal fluid by a medicated one or a serum. Since then the fluids used have been many, as, for instance, lysol, perchloride of mercury, iodoform, potassium iodide, anti-meningococcal, -pneumococcal, and -diphtheritic serums. So far the results have been inconsistent, but the method is worth persevering with, as it is the only way in which one can attack the organism directly. I must admit that my own experience with lysol injections was decidedly discouraging, as six out of seven cases, in which I tried it, died. I varied the strength of the solutions from 50 per cent. to 1 per cent., and as normal salt solution is also injurious to the meningococcus, I made the dilutions in it. Saeger,⁶⁸ who introduced the lysol method, used from 9 to 10 c.c. of a 1 per cent.

solution, and obtained good results. Franca⁶⁹ also used a 1 per cent. solution, giving it in quantities varying with the age of the patient: for children from 3 to 9 c.c., and for adults from 12 to 18 c.c. He first withdrew from 25 to 50 c.c. of the cerebro-spinal fluid, and, if this was very purulent, the canal was flushed with saline solution. Of 47 cases, treated by simple puncture, 30, or 64 per cent., died, but of 58 cases, treated by the lysol injection, only 17, or 29 per cent., died. He considers that the course of the disease is shortened, and relapses are prevented.

Serums.—Anti-diphtheritic Serum. The use of this was suggested by Wolf, of Hartford, Connecticut, to whom it occurred that there might be some antagonism between the two organisms, because he noticed that there was a decrease of diphtheria coincident with the increase of cerebrospinal fever. He then found that pure cultures of meningococci were killed by anti-diphtheritic serum. He, therefore, treated four cases of cerebro-spinal fever by anti-diphtheritic serum and all recovered. The success hoped for by this method has, however, not been realised. The difference in the seasonal incidence quite sufficiently explains why the cases of diphtheria decreased with the outbreak of cerebro-spinal fever. The meningococci are so difficult to keep alive that it is not to be wondered at that they did not grow after being treated with antidiphtheritic serum.

Further, contradicting the idea that the two diseases are antagonistic, is the report by Simpson⁷⁰ of a case of cerebro-spinal fever being complicated by severe laryngeal diphtheria. Peabody⁷¹ treated 22 cases, and Waitzfelde⁷² treated 17 by antidiphtheritic serum, and both considered that no influence was exerted either for good or for the reverse.

Antipneumococcal Serum.—This seems more likely to be of use than antidiphtheritic, owing to the close resemblance of pneumonia to cerebro-spinal fever, and of the pneumococcus and meningococcus to one another. I only used it once, owing to the presence of some gram positive diplococci in the cerebro-spinal fluid. No good result followed its use.

Ievers and Elder, however, noted improvement after its injection, saying that the patient became quieter and went to sleep; the temperature rapidly fell, followed by a rise some

time later, but the patient seemed better and the pulse stronger.

Antimeningococcal Serum.—The production of a really satisfactory serum of this nature should not be long delayed, and to this we must look as being the most rational, and the best method of combating this disease. Jochman⁷³ produced a serum for which he claims distinct therapeutic properties; with it he was able to confer immunity to mice against 6 times the ordinary lethal dose of the cocci. For humans, doses of 20 c.c. are required either intra-spinally or subcutaneously.

Of 17 cases treated by it only 5 or 29.4 per cent. died. Merck, of Darmstadt, claims to put on the market a serum produced according to Jochman. I unfortunately have not had an opportunity of trying it. Ruppel's serum I tried in 3 cases. Case 27 was first tried as being a very acute case, he died the same night. Case 36 was a typical chronic. No difference was noted after the injection one way or the other. Case 37 was an example of a moderately acute case. She appeared to improve a little after the injection and ultimately recovered.

Recently Flexner's serum appears to be giving very satisfactory results, and, where used, to have brought down the mortality considerably.

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TABLE I.

Case.	Age in Years.	Sex.	Rooms in House.	Adults.	Children.	Preceded by Injury.	Occupation of Patient.	Occupation of Patient's Father.	Duration.	Result.
1	10	M.	—	—	—	—	—	—	5 mos.	Died.
2	6½	M.	3	2	5	—	—	Dock labourer	7 days	"
3	7	F.	4	2	2	—	—	" "	7 wks.	Cured.
4	45	F.	2	3	0	—	Factory hand	—	19 days	Died.
5	41	F.	4	5	0	—	Crèche matron	—	17 wks.	"
6	27	M.	2	5	0	—	Miner - -	—	3½ "	"
7	5	M.	3	2	4	—	—	Salesman in docks.	10 "	"
8	6	F.	2	2	5	—	—	Driller in docks.	18 days	"
9	16	F.	2	3	0	—	Factory hand	—	8 "	"
10	4	M.	2	2	1	—	—	Dock labourer	7 "	"
11	7½	M.	4	2	3	—	—	Brass finisher in docks.	20 wks.	Cured.
12	16	F.	2	4	5	—	Factory hand	Engineer in docks.	10½ "	"
13	14	M.	7	5	5	—	—	" "	9 "	Died.
14	5	F.	} Lodging House.	{	{	×	—	Vagrant -	31 hrs.	"
15	3	F.				—	—	Rag picker, miller's sack.	3 days	"
16	9	F.	4	3	3	—	—	Storekeeper -	18 "	"
17	7	M.	2	2	2	×	—	Carter in docks.	7½ wks.	Cured.
18	11½	F.	3	2	1	—	—	Slater - -	4 "	Died.
19	4	M.	2	2	4	×	—	Dock labourer	20 days	"
						2 wks. before.				
20	15	F.	2	6	3	—	—	Carter - -	6 wks.	"
21	12	M.	2	5	2	—	—	—	9 days	Cured.
22	3½	M.	2	2	3	—	—	Ice cream -	6 wks.	"
23	2½	M.	1	1	3	—	—	Labourer -	24 "	"
24	9	F.	2	4	1	×	—	Dock labourer	4 mths.	"
25	2	F.	2	2	4	—	—	?	11 days	"
26	5½	F.	2	3	2	—	—	Maltman -	4 "	Died.
27	40	M.	3	6	0	—	Canvasser -	—	5 "	"
28	16	M.	2	4	2	—	Wood chopper	—	3 "	"
29	50	M.	2	3	2	—	Maltman -	—	22 hrs.	"
30	7½	F.	5	9	6	—	—	Dock labourer	21 "	"
31	20	F.	4	5	0	—	Pawnbroker's assistant.	School board officer.	5 days	"
32	6	M.	2	4	2	—	—	—	73 "	Cured.
33	8	M.	2	4	5	—	—	Dock labourer	36 "	Died.
34	7	M.	2	4	3	×	—	" "	3 "	"
35	5	M.	3	6	3	×	—	Sailor - -	11 "	"
36	27	M.	2	3	3	—	Byreman -	—	74 "	"
37	8	F.	2	2	2	—	—	Dock labourer	4 mths.	Cured.
38	20	M.	3	6	0	—	Engineer in docks.	—	21 days	Died.
39	4	M.	2	2	4	—	—	Biscuit baker	55 "	"
40	1	M.	2	3	5	—	—	Dock labourer	8 "	"

M. = Male.

F. = Female.

TABLE II.—EXAMINATION OF THE BLOOD.

Case.	R.B.C.	Wh.B.C.	Hb. percent.	Colour Index.	Poly. percent.	Lymph.	Large Monon.	Eosin.	Transi- tionals.
1	No count.				—	—	—	—	—
2	5,550,000	16,000	110	1'00	—	—	—	—	—
3	5,910,000	53,000	110	'93	83	17	0	0	0
4 ¹	5,557,000	15,000	118	1'07	88	11	1	0	0
4 ²	—	13,750	—	—	—	—	—	—	—
5 ¹	5,200,000	25,000	115	1'10	—	—	—	—	—
5 ²	—	31,000	—	—	—	—	—	—	—
5 ³	4,500,000	8,125	98	1'08	—	—	—	—	—
6 ¹	5,630,000	21,000	115	1'02	72	23	3	—	2
6 ²	4,900,000	18,750	105	1'07	—	—	—	—	—
7 ¹	5,580,000	20,280	115	1'03	75	18'5	5'0	1'5	0
7 ²	—	15,600	—	—	—	—	—	—	—
8 ¹	5,950,000	18,120	118	'99	81	13'5	4'5	0	1'0
8 ²	—	62,500	—	—	—	—	—	—	—
9	6,650,000	25,500	120+	1'00	—	—	—	—	—
10	5,850,000	15,650	115	'98	87	12	0	0	1'0
11	5,160,000	38,750	120	1'16	95'5	2	'5	0	1'5
12	6,556,000	16,250	110	'84	82	10'5	4'0	1'5	2'0
13	5,950,000	37,500	98	'82	—	—	—	—	—
14	—	18,000	—	—	—	—	—	—	—
15	No count.								
16*	4,900,000	34,625	110	1'12	70	25'5	3'0	0	1'0
17	5,220,000	34,375	115	1'10	83	11	6	0	0
18	6,500,000	13,125	115	'88	—	—	—	—	—
19	4,400,000	32,000	102	1'16	86	8'5	5'5	0	0
20	No count.								
21	No count.								
22	4,600,000	14,635	96	1'04	84	11	5	0	0
23	4,850,000	18,750	105	1'08	84	7	5	0	0
24	No count.								
25	No count.								
26	4,850,000	21,840	105	1'08	—	—	—	—	—
27	4,580,000	16,500	115	1'26	72	27	1	0	0
28	5,960,000	16,875	120	1'00	92	5	3	0	0
29	—	28,500	—	—	—	—	—	—	—
30	No count.								
31	5,930,000	15,000	120	1'01	87	6	4	0	3
32	4,630,000	30,375	108	1'17	—	—	—	—	—
33	5,900,000	14,375	110	'93	68	21	6	2	3
34	No count.								
35	4,950,000	62,500	102	1'14	73'5	15	7'5	2	2
36	4,950,000	19,375	120	1'21	85'5	8'5	2'0	'5	3'5
37	4,600,000	22,460	90	'98	70'	28	0	2	0
38	4,850,000	15,250	120	1'23	84	13'5	0	0	2'5
39	4,600,000	24,375	112	1'21	76	18	4	0	2'
40	6,250,000	27,575	115	'92	77'5	19'5	1	0	2

* Basophiles, '5 per cent.

TABLE III.—LUMBAR PUNCTURE.

Case.	Quantity.	Pressure.	Character of the Fluid.	Albumen in gram p. Litre.	Meningococci.
1	Dry tap.				
2	17 5 c.c.	Rapid drops	Very turbid	Trace	Present.
3	No note	Slow drops	Nearly clear	3·25	A few found.
4	5 c.c.	„	Turbid	3·5	{ + I. few. + E. swarms.
5	Dry tap.				
6 ¹	23 c.c.	„	—	9	Men. + all I.
6 ²	42 c.c.	„	Slightly turbid	4·5	Men. —
7	20 c.c.	Slow drops	—	9	+ I. and E.
8	15 c.c.	—	Turbid	5	+ I. and E. few.
8 ²	19 c.c.	—	Turbid and clots	1	+ I. few.
9	8 c.c.	Spurted out high	Turbid	6	+ I. few.
10 ¹	17 c.c.	High	„	4	+ I. and E. many.
10 ²	Small	clot only obtained.			
11	26 c.c.	Rapid drops	Slightly turbid	1	+ I. very few.
12 ¹	3 c.c.	Slow drops	—	—	+ E. only two seen.
12 ²	15 c.c.	Slight pressure	Clear	5·5	—
13 ¹	33 c.c.	Fairly high pressure.	Slightly turbid	1	+ few.
13 ²	13 c.c.	—	—	3	—
14	4 c.c.	—	Turbid	—	+ I. few.
15	7 c.c.	Rapid drops	—	6	+ I. few.
16	15 c.c.	—	Nearly clear	1	+ I. few.
17	7 c.c.	Moderate	Very turbid	7	{ + I. few. + E. many.
18	12 c.c.	Slight pressure	Slightly turbid	28	+ few.
19	12 c.c.	Rapid drops	Very turbid	2	+ I. and E. many.
20	—	—	—	—	—
21	—	—	—	—	—
22	17 c.c.	31 c.m.	Turbid	2	+ E. and I. swarms.
23	3 c.c.	Slow drops	„	—	+ E. and I. many.
24	4 c.c.	—	—	—	+ I. and E. few.
25	15 c.c.	Spurted out, 27 c.m.	Very turbid	5·5	+ I. and E. many.
26	15 c.c.	46 c.m.	Turbid	5	+ I. and E. few.
27	10 c.c.	19 c.m.	Very turbid	10	+ I. and E. few.
28	19 c.c.	Spurted out 48 c.m.	„	6	{ + I. few. + E. many.
29	—	—	Slightly turbid	—	+ I. and E.
30	2 c.c.	Very slow drops, 8 c.m.	Very turbid	—	None found, though just before death.
31	17·5 c.c.	Slow drops 56 c.m.	„	5·5	{ — I. + E. few.
32 ¹	9·5 c.c.	45 c.m.	Slightly turbid	5	None found.
32 ²	11·5 c.c.	28 c.m.	„	3·5	+ I. many.
33	13 c.c.	20 c.m.	Very slight turbid	75	None found.
34	2 c.c.	Very slow drops, 77 c.m.	Very turbid	—	+ I. and E.
35	16 c.c.	Rapid flow 59 c.m.	Turbid	2·25	+ I. and E.
36	15 c.c.	33 c.m.	Very turbid	2·00	+ I and E. few.
37	—	—	—	—	—
38	26 c.c.	Flowed rapidly 67 c.m.	—	5·00	+ I. and E. few.
39	16 c.c.	Rapid drops 58 c.m.	Turbid	3·5	{ + I. very few. None E.
40	3·5 c.c.	23 c.m.	Turbid and blood stained.	—	+ I. and E.

I. = Intracellular. E. = Extracellular.

TABLE IV.—LUMBAR PUNCTURE.

Case.	Cell count per c. mm.	Poly. per cent.	Lymph.	Large Monon.	Transi- tionals.	Degenera- tive Forms.
1	—	—	—	—	—	—
2	—	—	—	—	—	—
3	—	88 per cent.	12 per cent.	—	—	—
4	—	93 "	2 "	0	5 per cent.	0
5	—	—	—	—	—	—
6 ¹	—	Large No.	—	—	—	—
6 ²	2,500*	"	—	—	—	—
7	—	94 per cent.	6 per cent.	0	0	0
8 ¹	—	97 "	3 "	0	0	0
8 ²	—	93 "	3 "	2 per cent.	2 per cent.	0
9	—	98 "	2 "	0	0	0
10 ¹	—	65 "	6 "	0	0	29 per cent.
10 ²	—	All cells degenerated.				
11	31,250	83 per cent.	3 per cent.	0	14 per cent.	0
12 ¹	9,370	81 "	10 "	0	2 "	7 per cent.
12 ²	3,750	79 "	21 "	0	0	0
13 ¹	9,300	88 "	5 "	7 per cent.	0	0
14	—	Many.	Few.	—	—	—
15	—	97 per cent.	3 per cent.	0	0	0
16	12,500	92 "	8 "	0	0	0
17	56,250	95 "	5 "	0	0	0
18	1,500	59 "	41 "	0	0	0
19	43,750	89 "	11 "	0	9	0
20	—	—	—	—	—	—
21	—	—	—	—	—	—
22	40,000	92 per cent.	3 per cent.	5 per cent.	0	0
23	35,750	87 "	13 "	0	0	0
24	14,750	87 "	9 "	4 per cent.	0	0
25	143,750	88 "	2 "	3 "	7 per cent.	0
26	34,320	94 "	0 "	6 "	0	0
27	70,000	98 "	1 "	1 "	0	0
28	49,500	97 "	1 "	2 "	0	0
29	—	Large No.	—	—	—	—
30	58,750	93 per cent.	4 per cent.	3 per cent.	0	0
31	81,250	96 "	4 "	0	0	0
32 ¹	10,000	79 "	3 "	0	0	18 per cent.
32 ²	9,900	96 "	2 "	0	0	2 "
33	780	—	—	—	—	—
34	97,344	91 per cent.	7 per cent.	2 per cent.	0	0
35	—	89 "	6 "	1 "	0	4 per cent.
36	5,625	—	—	—	—	—
37	—	—	—	—	—	—
38	45,000	92 per cent.	5 per cent.	1 per cent.	2 per cent.	0
39	21,000	92 "	5 "	3	0	0
40	—	—	—	—	—	—

* Followed by sudden death.

DISEASES OF CHILDREN: A REVIEW.

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Meningococcus Infection. Serum Treatment.—Extensive experience has now been gained of the effects of antimeningococcus sera in various portions of the civilised world. There are several such sera before the profession, but the only two, which have been widely employed, are those of Ruppel and of Flexner. With regard to the former there is as yet no large collection of statistics published, but many isolated cases have been reported in which the results of the injection have apparently been most favourable. Flexner's serum, on the other hand, has been extensively used, both in this country and in America, and careful statistics have been compiled from the records of the cases so treated. In May, 1908, Flexner¹ analysed the records of 400 cases, treated by means of his serum, in a paper read before the American Pediatric Society. The cases treated arose in different and widely separated parts of the United States, Canada, and Great Britain. In some instances, they occurred in considerable numbers, that is, as local epidemics, in others, they occurred as sporadic outbreaks limited in number. Flexner has rightly refused to accept for his statistics any case which is not firmly based on bacteriological diagnosis, and, from this point of view, his figures may be accepted as absolutely accurate; the only selection of cases which he has made has been the rejection of any case, in which death followed the first use of the serum within 24 hours. After making these deductions, he found that of 393 cases, in which the serum was used, 295 recovered, and 98 died. Analysing these figures according to the age of the patients, he finds that the average mortality of 25 per cent. is raised to 50 per cent. in children under one year of age, and is lowest—11·4 per cent.—in children between 5 and 10 years of age. The period of injection of the serum has apparently a marked effect upon the result; the earlier the serum is used the lower

the mortality ; and the less frequent the complications. In fact Flexner notes that, in the cases which recover, the sequelæ, with the exception of deafness, are few and unimportant. The publication of this series, carefully compiled, gives the medical profession fresh hope in the treatment of this serious disease. It is true that the majority of Flexner's cases were of the epidemic variety, and comparatively few of the sporadic type which is so familiar in the large towns of this country ; but, from the small experience which we have had with Flexner's serum in such cases, it is permissible to expect that the results of a wider use will be to confirm our hopes. At present the mortality in infants, under one year of age, is certainly at least 20 to 30 per cent. higher than the 50 per cent. of Flexner's series, and, though in older children the mortality is less, it is still much higher than Flexner's 25 per cent. There is one further point to be noted, that the period of injection should be as early as possible, and hence the great importance of early diagnosis by the only trustworthy method, lumbar puncture, and withdrawal of the cerebro-spinal fluid.

Vaccine Treatment.—The number of cases, treated by means of vaccine, which has hitherto been reported, is small, and those which have been published have been almost all successful cases. Thus Mackenzie² reported a case in a girl of 6 years, in whom a vaccine prepared from the cocci, isolated from the cerebro-spinal fluid, was inoculated subcutaneously on the fifth day of the disease. Further inoculations were made on the 14th, 21st, 33rd, 43rd and 50th day of the disease, and a month later convalescence was complete. In the clinical history of this case, however, there is nothing to suggest that the vaccine had any influence upon the course of the disease, which, as we know, often at this age terminates favourably. On the other hand, there are several cases within my own knowledge in which the termination has been unfavourable, though vaccine treatment was employed early ; and, with our present knowledge, it is safe to say that the promise of vaccine treatment of meningococcus infections is poor compared with that held out by the serum treatment.

Tuberculosis.—The International Congress on Tuberculosis, which was held in Washington, in September and October,

1908, produced a considerable amount of interesting work, which is briefly reviewed by H. W. Orr.³ He states that, in general, it has been found that 7 per cent. of infants under one year of age are affected with tuberculosis. This figure at first sight appears very high, and, judging by the available statistics, which, however, according to Newsholme,⁴ are not very trustworthy, is almost certainly beyond the mark for England. Orr goes on to state that probably 10 per cent. of all children succumb to this disease. If he means that 10 per cent. of all children alive, under the age of 15, die of tuberculosis, his figure for this country is absurdly high. Newsholme estimates that .4 per cent. of infants living under one year of age die of tuberculosis, and for the school age, 5 to 15 years, for which period the figures are much more accurate, the percentage is very much lower, about .07 per cent.

Whatever the figures may be, it cannot be disputed that there is an immense waste of life, especially of infant life, owing to the existence of a disease, which can be, with proper precautions, all but completely eradicated. Hence we find that a great many papers were contributed at the International Congress, dealing with the transmission of tuberculosis. The majority of the authors agreed that the infection was post-natal, and usually by direct transmission; inheritance, even of a disposition to tuberculosis, appears to play a smaller part in our conception of the ætiology every year.

The possibility, however, of placental transmission was established in a paper by Warthin,³ who showed some specimens which exhibited this rare condition. A thesis presented to the University of Montpellier by Emile Bernard,⁵ on the subject of congenital tuberculosis, agrees that the fact is established, but submits that it is nevertheless extremely rare, and that contagion is the primary condition of infection.

Sources of Infection.—The researches of the various commissions in this and other countries have definitely established the fact that bovine tuberculosis is one of the common sources of infection; and the important fact has been demonstrated that cows, infected with tuberculosis, give milk which contains tubercle bacilli, although the udders may be absolutely healthy. Ravend⁶ has satisfied himself by his own experiments of the

truth of this statement, and rightly urges that it is an argument of the greatest importance for the more efficient inspection of dairy cattle. On the other hand, it should be stated that the English Royal Commission holds that the evidence of the presence of virulent tubercle bacilli in the milk of cows whose udders are healthy is not convincing, and Sir John MacFadyean⁷ considers that the important question is not what numbers of milch cows are tuberculous, but what numbers have tuberculous disease of the udder. Whatever the result may be of this conflict of scientific opinion, it can at least be stated that the proportion of infected milk supplied to towns in this country is high, probably as high as 15 per cent. of all samples. It follows that the utmost precautions must be taken as regards the supply of milk to children, and all milk from an uncertified source, supplied for their food, should be subjected to a temperature of 85° C. (185° F.) for five minutes before use. Such a temperature is sufficient to render harmless any but the most hopelessly contaminated milks. It is, however, to be hoped that the result of the present Royal Commission's labours will be to establish a much higher standard of cleanliness, and of exclusion of tuberculous cattle from the milch-herd than has hitherto been observed by the farmers and dairymen of this country.

Cutaneous and Ophthalmic Methods of Diagnosis.—The diagnosis of tuberculosis was a subject which occupied much attention at the Washington Congress. Both Calmette and Von Pirquet read papers upon their respective methods, and Ladislaus Detre of Budapest contributed a paper dealing with Von Pirquet's methods, which is described as one of the features of the Congress. He claimed that, by the use of special preparations of tuberculin, he could distinguish between the bovine and human types of infection, and could therefore determine what form of tuberculin should be used as a therapeutic agent. This, if it is confirmed by subsequent work, is in truth a most important advance in our methods; for there can be no doubt that, in selected cases, the use of tuberculin is of the greatest advantage.

Robert Bing⁸ has carried out a series of comparative tests of Calmette's and Von Pirquet's methods, and concludes that

the cutaneous method is the more delicate of the two; he believes that it gives us evidence of the existence of a tuberculous focus anywhere in the body, while the Calmette reaction only indicates the presence of an active focus. He finds what has, we believe, been the experience of a great many English observers, that the Calmette conjunctival reaction is at times of great severity, leading to purulent conjunctivitis, and even to corneal ulceration. A similar series of comparative tests has been made by H. Shaw⁹ with results that go to show that the cutaneous method is preferable to the ophthalmic test, because of its freedom from unpleasant results, and also because it is slightly more delicate. He gives reasons, however, for believing that neither reaction is invariably obtained in tuberculous infants, showing that, whereas the proportion of tubercle found at autopsy is at least as high as 5 per cent. in infants under 12 months of age, the proportion indicated by these tests is not more than 1.5 per cent. The deduction which we may draw from these papers is that, whenever it is of importance to establish the diagnosis immediately, the use of Von Pirquet's reaction is indicated, and that a positive result points strongly to the existence of the disease, while a negative result is inconclusive.

Pulmonary Tuberculosis in School Children.—Dr. Mary H. Williams¹⁰ has recently published an interesting paper on Pulmonary Tuberculosis in School Children, in which she maintains the position that a very much larger proportion of children of school age suffer from unrecognised pulmonary tuberculosis than has hitherto been admitted. Unfortunately her paper is largely the expression of her own individual opinion, and, as Dr. Fisher and Dr. Carr have since pointed out, lacks the support of post-mortem evidence. We are not aware of any figures based upon incontestable evidence, which indicate anything like the percentage of tuberculosis estimated to exist by Dr. Williams, and it is probable that the high figure, which she states, is obtained by the comparatively low standard of proof which she requires. She does not, for example, believe in the existence of a non-tuberculous chronic bronchitis between the ages of 5 and 50 years; and the list of symptoms, on which she states that she relies for the diagnosis, would certainly condemn as

tuberculous a very large proportion of the attendants at the out-patient departments of children's hospitals.

Urinary Tuberculosis in Children.—Leedham-Green¹¹ read a paper on the diagnosis of Urinary Tuberculosis at the provincial meeting of the Society for the Study of Disease in Children, held at Birmingham in June 1908. He believes that it is often overlooked, and quotes the general opinion, that urinary tuberculosis in children is comparatively rare, only to condemn it. He does not, however, in his paper quote any statistics relating to children, and again the experience of all physicians, who have had the opportunity of seeing a large number of post-mortem examinations in children, tells very decidedly against his beliefs. It is extremely rare to find active, or obsolete tuberculosis in the urinary passages or organs of children under 12 years of age, except where there is a generalised tuberculosis, and even in such cases, the urinary system is not at all a common seat of disease.

Nephritis in Children.—The subject of inflammation of the kidney in children is one that is much in need of treatment by the mind of a master of medicine. It is evident to anyone who casts a cursory glance over the medical journals, that there is a great deal of clinical material for such a study, and that the disease differs in many points from that of adults. For example, Rist¹² reports the case of a boy, 3 years of age, who was the son of a medical man, and had not suffered from any recognised illness, but in full health was observed to have his face swollen. On examination his urine was almost solid with albumin, and was, on being accurately measured, found to be somewhat diminished in quantity. On centrifugalising the urine, Rist was unable to find either pus cells, blood corpuscles, or casts. Six days later, the urine was free from albumin, and has since remained so. Rist rightly remarks that it is idle to assume in such cases the existence of a latent scarlatina; adding, what we believe to be perfectly true, that much too great stress has been laid on scarlatina as a causal factor in nephritis.

Such temporary albuminuria is of considerable interest, and it is tempting to speculate as to the probable renal history of the patients; whether they are more prone to develop true inflammatory lesions of the kidney than other

children, or whether the albuminuria merely represents the temporary effect upon the kidney of some obscure product of metabolism. It is of great interest also to compare, with such phenomena, the well-known cases of œdema without albuminuria. These cases are by no means uncommon, and are often reported in medical literature. The majority of them appear to belong to a class in which there is no lesion whatsoever of the kidney; and the œdema, closely as it may simulate that of renal disease, is believed to be very nearly allied to the urticarial œdemas, depending upon the absorption of some poison ingested or manufactured in the intestinal canal. Such a case was reported by Herringham,¹² and was treated by the exclusion of chlorides from the diet. His conclusion is that "the œdema was probably toxic, and due to the same toxine as that responsible for the œdema of nephritis." In a somewhat similar case, not reported, we had the opportunity of examining the kidney microscopically, and found in it no trace of any pathological lesion, confirming the results obtained previously both by ourselves and others.

Chronic nephritis in children has recently been made the subject of a study by Oscar Herbst,¹³ published in the *Fahrbuch für Kinder keil Nunde*. It is based on the analysis of a large number of specimens of urine passed by children suffering from various urinary disorders. Herbst examined the urine of children who suffered from orthostatic albuminuria, and found that there was constantly present in the centrifugalised deposit a considerable number of hyaline casts, and of red blood corpuscles, and that this was the case whether the specimen examined contained albumin or not. Clinically, the children were all below par in general health, anæmic, tiring easily, suffering from headaches, and loss of appetite and weight. He asked himself the question whether it might not be the case that such hyaline casts and red blood corpuscles are ordinarily present in children who are anæmic but have no albuminuria, and in order to answer it, examined the urine of 282 boys of from 6 to 14 years of age, who were otherwise in good health. He found either hyaline casts or red blood corpuscles, or both, in 47 per cent. of the cases, and hence agrees with other authorities, who hold that the presence of hyaline casts is not pathological, but may even be termed

a normal phenomenon. On the other hand, he believes that where granular and blood casts are found in any quantity, with or without albuminuria, there is a latent nephritis, and concludes that, for the diagnosis of nephritis, it is not sufficient to be content with an examination for albumin, but, in its absence, to examine carefully the centrifugalised deposit from the urine.

Zahorsky¹⁴ has written a short but interesting paper on the subject of urinary infection in childhood, a subject which has recently attracted a great deal of attention. He points out how easily the disease may be overlooked, or confounded with some other febrile complaint. Unlike most other recent writers on the subject, he believes that the bladder is most often the seat of infection, but records a most interesting autopsy, in which the whole of the urinary tract was inflamed and ulcerated. He classifies the clinical types, much as other writers have done :—(1) a febrile form, with or without symptoms pointing to disease of the urinary passages ; (2) a form in which there is a general failure of health without fever, and without urinary symptoms ; and (3) a form in which the main symptoms is urinary incontinence. We may add that the incontinence is usually diurnal as well as nocturnal, and is, as a rule, unaccompanied by pain. For treatment, he relies upon dosage with urotropin, and notes that fairly large doses are necessary, and that too long continuance of the drug leads occasionally to severe pain and hæmaturia. He remarks also upon the occurrence of relapses, and insists on the necessity of continued supervision after the immediate attack has ceased. Box,¹⁵ in a paper on the same subject, covers similar ground, and reaches the same conclusions, but believes that the infection is generally ascending from the urethra to the bladder, and thence to the pelves of the kidneys ; hence he lays great stress on the necessity for prophylaxis. The infection is almost invariably with the bacillus coli communis.

Milk Supply in Towns.—At a time when the subject of clean milk is so much in evidence, it is interesting to observe the measures taken in America to ensure the provision of milk in good condition. The drastic legislation in New York has been followed with more or less fidelity in the other big cities of the Eastern United States, and Mason Knox¹⁶ reviews the

recent campaign for pure milk in Baltimore. He summarises the main features of the law now passed as follows:—(1) No one can deal in milk without a licence from the Health Department. To obtain such a licence he must make application describing in detail his plan and method of business, and must submit to thorough inspection; (2) the Health Department can revoke the licence after ten days' notice for wilful or repeated violation of the provisions of the ordinance, and from their decision there is no appeal; (3) the Health Department can adopt such regulations as to sale and transmission of milk as may seem good to it; (4) and, most important of all, the Health Department can prevent the sale of milk produced on any farm outside the city boundary whose tenant refuses to permit an inspection by the officials of the department. It will be obvious from this brief summary that Baltimore at least can boast of a better chance of good milk than London can at the present time: the only criticism being that there does not appear to be any provision made for excluding the milk of tuberculous cows. With the example of these large American cities, and of Paris before the public, and with the growing agitation for purer milk, it is permissible to hope that, before long, the milk supply of London will be more efficiently supervised than is the case at present.

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BACTERIAL VACCINES AND RATIONAL
IMMUNISATION.

By E. C. HORT, B.Sc., M.R.C.P.

THERE is to-day a controversy in progress to which, for general interest, it would be hard to find a parallel since the early days of Lister.

Here is a group of enthusiasts, admirably marshalled, who honestly believe that all future triumphs over bacterial disease are to be won by emulsions of dead bacteria. Their activities, within the fold and outside it, sufficiently proclaim their faith.

There are critics that, after careful trial, find much to approve in bacterial vaccine therapy, much to deplore.

Here again are sceptics to whom vaccines are all anathema, and there the bulk of the profession, now urged to embrace the syringe and eschew the medicine bottle, now wondering if zeal outruns discretion.

To those that still preserve an open mind as to the true value of bacterial vaccines these brief reflections are addressed.

In face of the many good results reported, both by not unnaturally biassed workers and by more impartial observers, there can be little doubt that bacterial vaccine therapy, even as now understood, is a distinctly useful addition to our art. Notably is this so in comparatively trifling disorders, associated with bacterial persistence, in which danger to life is little or none. In more serious affections, characterised for the most part by no gross tissue change, many most satisfactory results have also been recorded, though distinction between post and propter is, as ever, difficult to draw. Such successes are well deserved, and cannot but encourage future effort towards much needed refinement in method and control. Of inevitable failures there are, of course, many, though naturally less exploited than the triumphs. To gain a correct idea, outside the medical journals, of the practical value of bacterial vaccines, it is necessary to enquire of the many

busy practitioners, general and consultant, who have given the method a thorough trial in the most exacting of all schools, private practice. It will come as a surprise to many to learn the number whom experience of a very personal kind has obliged to discard the method, even after enlisting the services of the high priests of the vaccine-opsonic art. Complete failure, under ideal conditions, is surprisingly common.

So far, no effort seems to have been made to explain the cause of failure in conditions, such, for instance, as localised skin infections, where success, according to the articles of faith, should be most assured. We hear, it is true, of the possibility of failure being due to a mixed infection, variation in the strain of organisms concerned, and so forth, though procedures inspired by such suggestions do not constantly meet with better success.

Still less has any explanation been advanced to explain why the method fails, and is ever bound to fail, in the treatment of the majority of acute toxæmias—in conditions, in short, in which success is most urgently needed.

The true reason why the vaccinist of the day meets failure where failure should not occur, and failure where failure must occur, is not far to seek, and the explanation is very simple.

He has forgotten the intra-cellular factor in disease, and assumes much to which the present state of knowledge gives him no title. Therein lies his weakness.

He believes that the cell as a unit is only concerned, apart from its own nutrition, in repelling the attacks of extrinsic foes, and that enemies within its gates are non-existent. He is, therefore, at no pains to meet intrinsic trouble, either as cause or effect of extrinsic, and assumes that injection of dead bacteria provides all-sufficient stimulus for all essential response.

He does not recognise that cells or their derivatives may be poisonous not only to themselves but to the economy to which they belong, or that bacterial toxins may set in motion cell toxins. In the presence, therefore, of toxæmia he assumes it to be all bacterial, and believes that emulsions of bacterial origin will fulfil all his needs.

He assumes that immunity, as a whole, is merely a matter of protection against bacteria and their products, and that the dose of stimulus from bacteria, and the ability of response to such stimulus, are the only factors to consider in the sum-total of immunity that he seeks to establish.

Not only, in his view, are bacteria the essential and primary cause of diseases ostensibly associated with their presence, but an attack, say, of enteric or tuberculosis, is to him a sudden parasitic invasion: a bacterium is not, to-morrow it is.

An incubation period corresponding with no known cycle in the invader's life-history he plainly ignores. The doctrine of cryptogenic persistence, and the possibility of conversion of non-pathogenic into acutely pathogenic, arising from purely intrinsic precedent cell change, he regards as an amiable delusion.

He assumes a causal bacterial element in diseases in which laborious search can find none, and, when pressed, relies on the argument of "must be." He believes that, except in acute toxæmias, a causal organism cannot be recovered from the blood stream, and on his conception of a local and insulated nidus he builds an elaborate gauge.

He cultivates the floating phagocyte and ignores the fixed; is concerned with removal of bacterial débris and forgets the cellular. He assumes that, in inciting the production of anti-bacterial bodies, he is necessarily inducing antitoxic response, and regards preparation of solutions of endo-toxins for vaccines as outside his legitimate sphere. He takes for granted that effective immunisation, in terms of recovery, is the result of his injections, and is apt to deny to spontaneous inoculations their proper dues.

Such in barest outline is the position of the modern exponent of bacterial vaccines.

All the work, however, of recent years on cellular pathology goes clearly to show that the cells of the body have intrinsic foes to contend with, as well as extrinsic. Amongst the former are the intra-cellular enzymes. Of these the best studied are the self-digestive, or autolytic enzymes, which, if allowed to do so, can dissolve every cell in the body. Less well known, but no less important, are other ferments, which, unless constantly restrained, are capable of producing other

well-known aberrations of form and function of a cell besides digestion. All cell ferments must be restrained and inhibited to allow healthy cell life to go on, and are so restrained by their own anti-ferments. If this restraint is impaired, aberration begins. The tendency of all normality is towards abnormality. It is very generally assumed that morbid cell change is the result of external stress, such, for example, as bacteria and their products, and often no doubt it is. But we have no justification for asserting that successful bacterial infection may not often be the result of some unknown precedent intrinsic cell change. Nor is this all. The products of morbid cell activity, however such activity be induced, are as truly auto-toxic as bacterial toxins are hetero-toxic, and again we have no right to assume that any toxæmia is bacterial only. There is, in fact, abundant evidence to show that cell toxins require neutralisation as well as bacterial. When Nature cures an infection, which she succeeds in doing far more often than she fails, she converts both tissues and bacteria into vaccines, and calls out both cellular and bacterial restraint. In other words, besides antagonising bacteria and their toxins, she exerts both cellulotropic and cellulo-toxi-tropic control. The vaccinist of the day, on the other hand, is concerned with bacteria only. Content with response to one factor, he rides for a fall whenever cellular response is in serious demand. For no antibody quâ bacteria can enable cells already damaged to restore that state of immunity to intrinsic and extrinsic foes on which effective cell life depends. Nor can they antagonise toxic cell derivatives. The limit of their powers is to protect tissues still uninjured, or prevent further damage from external forces only.

The discovery of bacteria has not been an unmixed blessing, for it has diverted attention from the cellular aspect of disease, which in the clinical world has never received so little attention as now. The employment of matter from a small-pox pustule by Lady Montagu, in 1720, and the use by Pasteur of emulsions of infected spinal cord in rabies, as prophylactic agents, hold greater promise for the treatment of established disease than any use of vaccines purely bacterial. There can be no doubt that, in both cases, solutions of cell derivatives were as potent an agent in protection as any bacterial element

still undiscovered. In both cases the safeguard they afforded, and still afford, has never been surpassed, except in the case of diphtheria. Again, no vaccine of dead anthrax bacilli, however much it protects sheep against the disease, can ever cure in that animal the established disease, because it makes no provision for protecting cells against auto-toxæmia, induced by, and perhaps co-existing with, but certainly not identical with, bacillary poisoning. Once we can prepare cell emulsions and inject them in conjunction with suitable bacterial vaccines, the present reproach to the employment of the latter alone will be gone.

In the meanwhile we have, happily, in auto-vaccination a most admirable substitute, and one that will never be displaced. As time goes on we shall realise the immense importance of exerting both cellulo-tropic and bacterio-tropic response, when the natural provision for ensuring such double response breaks down. All progress in the art of medicine has been towards this point, though we have only dimly recognised what reaction involves—reaction to internal stimulus as well as external. A conscious and deliberate employment of increased intra-cellular stimulus, in addition to extra-cellular, combined with artificial hyperæmia, and use of all approved general methods of rendering response possible, is the route. Already, with this in view, we can show by auto-vaccination as good and better results, in tuberculous and other infections, as by the use of tuberculin and other extraneous vaccine: provided, that is, that the site of disease can be influenced.

The reflection that bacterial vaccine therapy, as practised now, is only a half-hearted imitation of the natural method of cure, is a chastening one. But the sooner we recognise its truth, the sooner we shall advance in rational immunisation.



THE FIRST THREE WEEKS OF PREGNANCY; AND THE PRACTICAL BEARING OF RECENT INVESTIGATIONS ON OUR KNOWLEDGE OF ECTOPIC GESTATION.

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UNTIL a very few years ago, the accounts given of the development of the human ovum from the moment of fertilisation until well on in the second month, were based upon theoretical considerations drawn from comparative embryology. The pictures and descriptions of the early weeks of gestation were of the ova of the chick, or the rabbit, or the dog. It was not possible to delineate and discuss any actually observed human ovum younger than the sixth or seventh week.

In October, 1895, a rare chance came to Hubert Peters, of which he took full advantage, and thereby, not only very notably enlarged our knowledge of the phenomena of early pregnancy, but made it certain that his name will go down to posterity as the discoverer of 'Peters' ovum.'

A woman, who had missed one menstrual period by two days, and who was believed to be pregnant, committed suicide. Peters carefully removed the uterus and hardened it. On opening it, a tiny bulging was found, which proved to contain an ovum, of which the longest external measurement was $\frac{1}{10}$ of an inch. The ovum was examined microscopically in serial section, and described in a monograph published in 1899. Since then quite a number of early human ova have been discovered and examined in the same elaborate way, and, as a result, it has been proved that the theoretical descriptions, heretofore given, have been very erroneous. In particular, our views as to the method by which the ovum was implanted in the uterus, and the relation of the decidua to it, have been revolutionised. The new facts form a fascinating chapter in the history of embryology, and, in addition, have a most important and practical bearing on our knowledge of the pathology of extra-uterine gestation.

The youngest known human ovum was discovered in

November 1907, and Drs. Bryce and Teacher, into whose hands it came, have recently published an account of it,¹ along with a summary of our knowledge of this subject.

There still remains an interval of some days, following fertilisation, which has to be explained in terms of comparative embryology, as no human ovum of so early an age has been observed; but the age of the Bryce-Teacher ovum has been fixed at about 14 days by data of the kind which enabled Tristram Shandy to name the day and hour of his conception with such accuracy. Over a dozen cases have now been recorded in which the ovum can hardly have been more than three weeks old, and the histological appearances, found in all of these, are sufficiently alike to enable a description of development at that early date to be given.

There may be some differences of opinion with regard to details, and slightly varied interpretations of the findings, but there is now general agreement on all essential matters. One chief difficulty in giving a popular account of the process lies in the highly specialised nomenclature with which treatises on embryology abound, and of which the following sentence (which purports to describe the Bryce-Teacher ovum) is an example:— "It shows a condition of the blastocyst quite unsuspected, since its walls are almost entirely plasmodial, with the exception of a thin cellular layer of trophoblast, the so-called cyto-trophoblast forming the lining of the blastocyst."²

One hopes, however, by avoiding unessential details, and using as sparingly as may be the technical language so suggestive of profanity, to be able to give a clear and simple history of what is believed to take place between the conjugation of spermatozoon and ovum, and the time when the growing ovum has become firmly implanted within the uterus, and has established a connection with the maternal blood circulation.

The mature ovum, when ready to escape from the Graafian follicle, is a large spherical cell from $\frac{1}{250}$ to $\frac{1}{600}$ inch in diameter, surrounded by a homogeneous layer, the zona pellucida, and containing a large germ-nucleus. Fertilisation occurs when the spermatozoon penetrates to, and becomes fused with this germ-nucleus. It is regarded as probable that the conjugation occurs usually about the fimbriated end of the Fallopian tube, but, as we shall see later, it may take place in the ovary, and it is not unlikely that the germ-cell and the

sperm-cell may meet anywhere along the length of the Fallopian tube.

The next stage has been observed in many animals, including the higher apes.³ The fertilised germ-nucleus at once divides into two, and each of these again divides, and so, by rapid sub-division, the zona pellucida becomes filled with a large number of small cells (blastomeres). These next become differentiated into larger cells and smaller cells, and the smaller ones, apparently by their more rapid division, come to surround the layer of larger cells, and the ovum (now known as the blastosphere) becomes a double layered hollow vesicle, in construction not unlike a child's rubber ball which has been indented by the finger until the one

surface is brought into contact with the other.



A thickening at this point of contact is the first evidence of the cell formation which will ultimately become the foetus. And soon from this germinal area there spreads out a third layer of cells, which fills the space between the other two layers. The layers are now known as the ectoderm, the mesoderm, and the entoderm, from without inwards. It is extremely important to remember that, at this stage, the future embryo is represented merely by a thickened band of cells.

While these changes are proceeding, the ovum is passing along the Fallopian tube in order to reach the interior of the uterus, to which it becomes attached, probably about the seventh day. "By this time, in all probability, segmentation is complete, but the ovum has hardly increased in size, still retaining the dimensions of the unfertilised oöcyte"¹ viz., $\frac{1}{125}$ th inch in diameter.

Now, what we used to be taught was that, on reaching the uterus, the ovum settled down in a hollow in the uterine mucosa, "folds of which grew up around it, and finally met so as to enclose it in a cavity of its own, shut off from the general cavity of the uterus."⁴ In other words, the ovum settled down passively in a crevice into which it gravitated, and allowed the uterine decidua to actively busy itself in making preparations for its welfare and nourishment. But the work of Peters and

subsequent observers has shown that the ovum itself is the active agent in the process of implantation. When it has reached a certain stage of development (possibly when the zona pellucida, which originally covers it, disappears), it becomes capable of actively burrowing into the tissue with which it is in contact, just as a woodlouse burrows into a tree. The uterine mucosa becomes thickened with the onset of pregnancy, and its glands become elongated and tortuous, so that the ovum has a considerable thickness of tissue in which to embed itself. When within its decidual bed, the ovum proceeds to do considerable damage. It sets up a process of coagulation necrosis in the tissue immediately surrounding it, and thus excavates a cavity which increases in size in correspondence with the now rapid rate of growth of the ovum. We are now in a position to understand a diagram of a section of the Bryce-Teacher ovum.

The decidua is seen to be very vascular, and its cells are

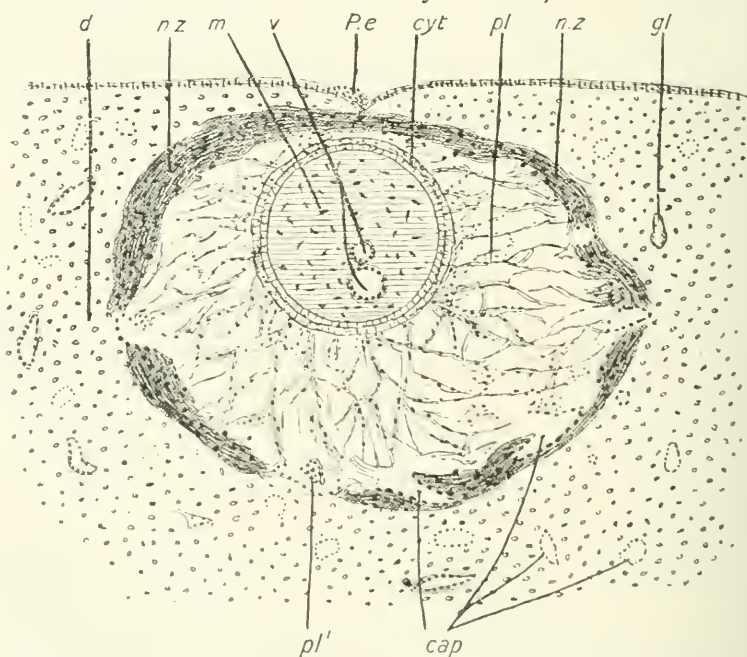


Fig. 1.

d. = decidua.
n.z. = necrotic zone.
p.e. = point of entrance of ovum.
gl. = glands.

cap. = capillaries.
pl. = plasmodium processes and spaces.
cyt. = cytotrophoblast.
m. = mesoblast.

large, and possess nuclei characteristic of rapidly growing tissue. The zone immediately surrounding the ovum is necrotic and in process of digestion and absorption. At one point the epithelium covering the decidua has disappeared, and a small plug of fibrin is seen. This is the point at which the ovum effected its entrance.

Coming to the ovum itself, we find that by far the greater part of it consists of the outer layer, which we knew as the ectoderm. This layer has now been differentiated into a narrow internal cellular layer, and a wide peripheral layer, the plasmodium. The plasmodium consists of very irregular branching processes, forming masses, bands, or threads. On and among these plasmodium processes, vacuoles and spaces appear, and, as the ovum eats its way into the decidua, the maternal blood-vessels are opened into. The blood thus extravasated does not coagulate, but serves to nourish the ovum, and, after a time, begins to circulate in the plasmodium spaces, which are indeed the primitive placental sinuses. Inside the trophoblast, the blastocyst consists mainly of mesochyme (= mesoderm layer), from which processes will soon begin to protrude into the primitive chorionic villi, and in these processes will ultimately be developed the placental blood-vessels. Careful search will reveal, in the middle of the mesochyme, the rudiment which is by-and-by destined to become the foetus, but it cannot be too strongly emphasised that, at this stage, almost the whole of the ovum consists of those parts which are to form the connections between mother and child, and by which the latter is nourished, and that the very energetic developmental changes now proceeding are practically entirely concerned with the establishment of the maternal-foetal circulation.

In the somewhat older ova, the necrotic zone of decidua has largely disappeared, and there is a mingling of foetal and maternal tissues: the nourishment of the ovum is assured.

So soon as this is accomplished, the destructive changes come to an end, and are succeeded by steady and regular growth, alike of embryo, placenta, and uterus.

Let us now apply what we have learned to cases in which the ovum develops outside the uterus. Anything which prevents the normal passage of the fertilised ovum along the Fallopian tube to the uterus will, if its action persists for

a few days, result in the ovum being still outside the uterus when it reaches that stage of development, at which it would normally burrow into the uterine decidua. And the burrowing is done, wherever the ovum may happen to be at that time. If the ovum has been retained within a Graafian follicle after fertilisation, it will burrow into the stroma of the ovary, the result being that very rare condition—primary ovarian pregnancy. Until a few years ago, many gynæcologists denied that any cases of this condition ever occurred, but all now admit that it does occur, and a typical example is described in the Bryce-Teacher monograph.

With few exceptions, however, the site of ectopic gestation is the Fallopian tube. In some cases the presence of kinks, adhesions, polypi, etc.,⁵ has been regarded as sufficient cause for the ovum failing to reach its natural growing site, but, in many others, nothing of the kind has been observed. Whatever the cause of the delay, when the fateful moment arrives, the ovum will bore its way through the tube epithelium. But instead of a mucosa $\frac{2}{3}$ th inch thick, such as is found in the pregnant uterus, there is in the tube an extremely thin mucous lining, having hardly any submucous layer separating it from the muscular layers, and the consequence is that the ovum burrows its way right into the musculature of the tube, a portion of which is destroyed by the same coagulation-necrosis which occurs around the ovum in the uterine mucous membrane. In

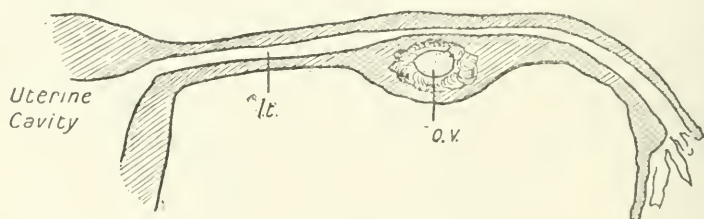


Fig. 2.

l. t. = lumen of Fallopian tube. ov. = ovum embedded in wall of tube.

this connection, it is interesting to note that cases of intra-uterine pregnancy have been recorded, in which, along with imperfect development of the decidua, there have been invasion and partial destruction of the uterine musculature.⁵

If we now trace the history of ectopic gestation from 1883, when Lawson Tait performed the first operation which was ever done for ruptured tubal pregnancy, to the present

day, we shall see that the interpretation of the findings has often depended on the observer's preconceived notions of pathology.

In the eighties, it was being taught that the object of menstruation was to leave a raw surface within the uterus, on which the ovum might graft itself. And so, a raw surface being deemed necessary for implantation, we find Tait postulating destruction of the tubal ciliated epithelium by the gonococcus, as the chief causal factor in the production of ectopic gestation. But we now know that one of the first effects of gonorrhœal salpingitis is to shut off the abdominal ostium by gluing the fimbriæ together, and gynæcologists of large experience, like Taylor⁶ and Cullingworth, have found no evidence of gonorrhœa in the vast majority of their cases of tubal pregnancy. Before the burrowing of the ovum was understood, and when the ovum was believed to simply get stuck in the tube, and surrounded by decidua, and then to steadily and regularly increase in size, the so frequent occurrence of rupture seemed to call for some special explanation. Men, who had seen a puerperal or a gonorrhœal salpingitis distend the tube to the thickness of a man's thumb in a very few days, and who knew how excessively rarely such a distended tube ruptured, were at a loss to satisfactorily account for the rupture which almost invariably interrupted the much slower growth of an ovum in the tube. And therefore Dürksen and others proceeded to find that the tube was pathologically thin in these cases. Such an explanation is no longer required. In the same way, we find Whitridge Williams, who had previously described cases "affording," as he said, "satisfactory proof" that diverticula of the tube were frequently present in which the ovum became caught, re-examining his sections in the light of our new knowledge, and finding that they were really "excellent examples of the normal process of intra-mural embedding of the ovum."⁵

When we come to consider the natural history of a case of ectopic gestation, the proneness to rupture becomes easily explicable.

Munro Kerr's case¹ is a typical one of ovarian pregnancy. A woman, aged 27, had one child, 11 months old. She had menstruated on November 20th, 1903, and, at the end of December, believed herself to be pregnant. On January 1st, 1904, she made complaint of pain in the back and

lower part of the abdomen. The pain recurred at intervals during the succeeding days, and was associated with abdominal tenderness and inclination to faint. On January 13th she was worse, and Dr. Munro Kerr diagnosed rupture of an ectopic gestation. On opening the abdomen, he was surprised to find that the Fallopian tube appeared normal, while a hæmorrhagic mass, about the size of a walnut, was seen projecting from the free surface of the ovary. This proved to be an ovarian pregnancy. Apparently the spermatozoon had conjugated with the oöcyte within the Graafian follicle. The fertilised ovum was retained there, and "went through the segmentation phases, and, as an early blastocyst, found itself within the contracting follicle, just as, normally, the blastocyst finds itself, after its passage through the Fallopian tube, in the uterine cavity. It now behaved as a uterine ovum would have done. It attacked the wall of the follicle, and embedded itself in the vascular connective tissue immediately without the capsule." Having lodged in the narrow band of stroma between the corpus luteum and the surface, the further growth of the ovum resulted in extensive destruction of ovarian tissue.

Plasmodium processes grew in among the necrotic tissue and blood-vessels were opened up as in the uterine decidua. There are, of course, much larger vessels in the ovary than in the uterine mucosa, and when the walls of one of these were eroded by the growing ovum, the escaping blood forcibly distended the plasmodium spaces, causing the pain and faintness noticed by the patient on January 1st, and on several occasions subsequently. The ovum continued to grow, and the necrotic area to extend until it reached the surface of the ovary, when, another blood-vessel having been opened up, the pressure of effused blood was too great for the resisting powers of the necrosed tissue, and rupture took place into the general peritoneal cavity. The patient would almost certainly have bled to death had not the surgeon speedily got to the spot, and clamped the ovarian artery.

Exactly the same history might be given of many cases in which the pregnancy is going on in the Fallopian tube. Fortunately, however, the large majority of the cases of tubal gestation terminate in ways less likely to be immediately fatal to the patient than sudden intra-peritoneal rupture.

There are four different ways in which a tubal pregnancy may eventuate, viz.: (1) growth may proceed without rupture of the tube; (2) rupture may occur after placental formation is well advanced, and the foetus may escape from the tube, while the placenta retains its tubal attachment; (3) intra-peritoneal rupture may take place before the embedding stage has been completed; and (4) intra-tubal rupture may occur at the same early stage.

1. *Embedding Stage completed without Rupture of the Tube.*—

The thinness of the tissues in which the ovum lies in the wall of the Fallopian tube, and the very considerable degree of pressure, which these tissues have to withstand, when blood is poured from the comparatively large vessels opened into in the course of the destructive process, which accompanies the embedding of the ovum, make this first class of cases a very small one. Such a case is described in the following notes:—A woman, aged 41, was admitted to the Bradford Royal Infirmary on March 21, 1901. She was married, and the mother of seven children, the youngest 3 years old. She menstruated just before Christmas, 1900, then had amenorrhœa for six weeks, at the end of which time she was seized with sudden pain in the abdomen, with vomiting and constipation. She was kept in bed for five weeks, during which time she had five attacks of pain, lasting on an average about twelve hours each; between the attacks she was almost quite free from pain. When the pain first came on, a vaginal discharge of "black water and blood" appeared, and there had been some blood-stained discharge ever since. During the last two weeks she had had no pain, and had been getting up and about. She complained of some aching and "stiffness" in the pelvis, and, as she had an abdominal tumour, she was submitted to operation by Mr. Horrocks. On opening the abdomen, the omentum was found adherent, and, on pushing it up, a cavity was opened from which a lot of clear brown fluid (altered blood-serum) escaped. An ordinary thin-walled left ovarian cyst was removed. The right Fallopian tube could be traced outwards from the uterus for an inch and a half, and then was merged in a cystic swelling the size of a small orange, to which omentum was adherent. This tumour was removed, and proved to be the dilated tube (its walls $\frac{5}{8}$ inch thick and infiltrated with effused blood) surrounding a definite

amniotic cavity containing a foetus $\frac{3}{4}$ th inch in length.

This patient had safely gone through the dangerous period, during which the ovum is excavating for itself the bed in which it hopes to lie until the foetus is fully developed. Communication between the maternal and the foetal blood-streams had been effected, and destructive excavation had been succeeded by steady growth, so that there was every likelihood of the pregnancy going on safely to term had no operation been performed. The patient had been getting about for a fortnight prior to the operation without any sign of bleeding or inconvenience. But, of course, at term the child would have had to be removed by abdominal section, and so considerable are the risks of operation undertaken at that stage (bleeding from the full-sized placenta, prolonged drainage of the cavity from which the placenta has separated, etc.), that there can be no question as to the propriety of removing a living ectopic gestation sac as soon as the diagnosis is made.

2. The second termination, although also not the common one, is more frequent than that just described. Growth may have proceeded until the foetal-maternal circulation is more or less efficiently established, and yet some part of the tube wall may be so thinned out that the rapidly enlarging ovum may cause the peritoneal covering of the tube to give way. If the placental site is involved in the rupture, dangerous or even fatal bleeding may result; but, should the placenta not be damaged, the bleeding may be trivial in amount. If the embryo escapes with its amnion intact, it is likely to continue to grow within the abdominal cavity, probably going to full term. On the other hand, if the amnion is torn, the foetus will die and undergo some form of degeneration, or absorption.⁶

3. *Intra-peritoneal Rupture*.—In the majority of cases, however, tubal-pregnancy is interrupted before the stage of placental development has been reached. In Werth's striking phrase, "The ovum, in making its bed, digs its own grave." Either the necrotic zone extends to and involves the mucous lining or the peritoneal covering of the tube, or so thin a layer of living tissue is left that very little pressure of blood extravasated from an invaded arteriole is sufficient to rupture one or both of these membranes. When the ovum is lodged in the intra-uterine portion of the tube (interstitial pregnancy), early intra-peritoneal rupture with very severe hæmorrhage is the

almost invariable termination, and, usually, the rupture takes place without the preliminary warning pains the occurrence of which we have described in Munro Kerr's case. Intra-peritoneal rupture is also a not very infrequent occurrence when either the middle or the ampullary end of the tube is the site of the pregnancy.

4. *Intra-tubal Rupture*.—Fortunately, however, intra-peritoneal rupture is a less frequent event than the much less fatal condition, where the rupture takes place into the lumen of the tube, this usually being accompanied by the formation of a tubal mole.⁷ This is brought about by the sudden opening up of some largish vessel by the burrowing ovum. The escaping blood distends the ovum capsule, and produces the pain and faintness, which have been described as repeatedly occurring in both the cases detailed above. Whenever the bleeding attack comes on, the ovum is in danger of being loosened from its connections with the tube wall, and the natural result is sooner or later the death of the ovum. Very occasionally, (4 cases out of 50 collected by Schmidt)⁸ the ovum is completely separated from its bed, and expelled into the tube, and towards the fimbriated end, a tubal abortion taking place. But, generally, the separation is incomplete, and a sanguineous mole is formed. An effusion of blood sufficient to kill the ovum, as a rule, also bursts through the mucous membrane into the lumen of the tube, along which blood is forced into the peritoneal cavity, where it forms a pelvic hæmatocele. It is when the blood is flowing along the tube that the most severe and continued pain is felt. The pain is of the same character as renal or biliary colic, and is indeed due to forcible contractions of the tube on its contained blood—a tubal colic in fact.

The following is a typical case of "tubal apoplexy," with what Taylor has called "blood drip"⁶ from the abdominal ostium, associated with severe tubal colic. I was called about 11 p.m., on June 29, 1907, to see a woman, aged 32, who had gone just eight days over her menstrual time. She herself had not thought of pregnancy, but a sister, who had called to see her, had told her (without being informed of the missed period) that she was pregnant. She knew (so she said) "by the look in the patient's eyes." The claim to be able in this way to diagnose pregnancy very early, I have heard advanced many times by "knowing" women, and, with a sufficiently

large percentage of accuracy to make one wonder whether there is anything in it. Three hours before I saw the patient, she had been suddenly seized with pain in the lower abdomen, and had been, with difficulty, helped home. When I saw her she was evidently suffering agonisingly acute pain. Her pulse was 80 and of good quality. There was some tenderness over the lower abdomen, but none of the rigidity which accompanies the pain of fulminating appendicitis. Per vaginam, there was extreme tenderness in both fornices, so that little could be made out; the examining finger when withdrawn was blood stained. I diagnosed bleeding ectopic pregnancy, and, regarding the quiet pulse and colicky nature of the pains as contra-indicating severe intra-peritoneal rupture, I decided to give the bleeding a chance to stop spontaneously, and accordingly administered $\frac{1}{4}$ gr. of morphia, and left word that I was to be informed if pain continued after two or three hours. Pain did persist, and the woman was consequently taken to the infirmary, where I removed the right Fallopian tube, the middle third of which showed a purple swelling of the size of a small walnut, which on section appeared to consist mostly of blood clot. No rupture of the serous covering of the tube was discovered, and blood was seen dripping from the ostium when the tube was pulled out of the pelvis. A pint or more of blood was removed from the abdominal cavity.

The intra-peritoneal bleeding, which occurs in tubal abortion, may vary from a mere trickle, continuing during a period to be reckoned in minutes, to a hæmorrhage so profuse as to endanger the patient's life. Generally "the hæmorrhage, though almost continuous or frequently repeated, is moderate in amount, and a well-defined hæmatocele is the sequel."⁶ Tubal mole formation is universally admitted to be the most frequent outcome of tubal pregnancy. In 289 cases reported by Martin and others, 78 per cent. ended by mole formation. Cullingford found that 23 out of 25 cases of hæmatocele were due to mole formation, and, in a summary of 35 cases of ectopic gestation operated on by Dr. Oliver of the Soho Square Women's Hospital,⁸ out of 23 specimens, where the ovum was evidently less than two months old, in only one was a rent in the peritoneal surface of the tube discovered. Two others were damaged during removal, and consequently may have been cases of intra-peritoneal rupture, but the other 20

were evident cases of intra-tubal rupture with hæmatocele formation.

The fact is that ectopic gestation is of much more frequent occurrence than was formerly believed. Many cases, in which a tubal mole is formed early, present symptoms so transient that the condition is not diagnosed, or even suspected, and, as Whitridge Williams puts it,⁵ "the great frequency with which the abdomen is now opened affords abundant opportunity for the recognition of many conditions which previously escaped discovery." I have seen a tubal mole with a small hæmatocele found where appendicitis had been quite legitimately diagnosed, and a fixed painful ovary, which, on the abdomen being opened, proved to be fixed in the pelvis by a small hæmatocele associated with a tubal mole. The following are notes of a case, which was diagnosed as one of tubal mole formation, in which the symptoms were so indefinite that, unless the condition had been definitely kept in mind, a correct diagnosis would not have been likely to be made. Mrs. S., married two years, but who had not previously been pregnant, went two weeks over her time, and then was suddenly seized with acute pelvic pain. She had to be carried up to bed, and she took a mixture containing chlorodyne to relieve the pain, which continued for two or three hours, and then went off rather suddenly. When my partner, Mr. Handcock, saw her next morning, she had practically no pain while lying still in bed, but the severe colicky nature of the pain, and the fact that she had "come unwell" during the night led him to make a vaginal examination. This revealed considerable tenderness in the left fornix, and a not at all definite sense of fulness. The patient was kept strictly at rest in bed, and, as there was no recurrence of pain, she was allowed up at the end of a week. Before she got up, another vaginal examination was made, and now a firm, fixed swelling, about the size of a bantam's egg, was discovered in the fornix. Indefinite pelvic pains persisted for several weeks after the patient began to get about, and it was not until two months had elapsed that she felt quite well again. She was then once more examined, and the lump was now found to have disappeared. At the first examination, the blood forming the hæmatocele had not had time to firmly coagulate; it had settled down into a solid coagulum at the

time of the second examination; the coagulum had been absorbed when the third examination was made.

The disastrous results of a failure to diagnose a case of tubal rupture are evident in the following case:—

Mrs. B. was admitted to the Bradford Infirmary, under Dr. Rabagliati's care, on June 16, 1900. She had gone a fortnight over her normal menstrual time, and then, on June 2, had an apparently normal menstrual period. Three days later, when straining at stool, she was seized with severe pain "in the womb" which caused her to faint. She kept her bed and soon the pain eased, but, as some pain and difficulty with defæcation continued, she came as an out-patient to the Infirmary on June 12. She was seen by one of the Residents, who evidently was not on the look-out for the possibility of sudden pelvic pain being the result of tubal gestation, and who gave her a carminative mixture. Next day the patient had another severe attack of pain, and persistent vomiting set in. When she was admitted as an in-patient on the 16th she was obviously suffering from intestinal obstruction from pressure of a large hæmatocele on the bowel, and, although abdominal section was performed, and a ruptured right tube and large masses of clot removed, the bowels never got properly to work again, and the patient died two days later.

Had the possibility of tubal pregnancy in every case of sudden pelvic pain been recognised, and a vaginal examination been made on June 12, the patient would have been warned and sent to bed, and the recurrence of pain would have been a signal for opening the abdomen at a stage when the operation would have been almost certainly successful.

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SOME POINTS OF MEDICAL INTEREST IN THE
NEW CHILDREN'S ACT.

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THE Act of Parliament the short title of which is the Children Act, 1908, is an exceedingly interesting and important one, especially to medical men, for so many of its provisions relate to matters with which the profession is intimately concerned. There are in the Act, which came into force on April 1 of this year, 134 clauses, all of which are intended to directly improve and help the conditions of child life, and to protect them not only from deliberate cruelty, but perhaps even more from the carelessness and indifference of their parents and guardians. It is only necessary to discuss a few of the clauses, those with which the profession may be supposed to be specially concerned; at the same time the whole Bill is well worthy of the attention of everyone interested in child life. It is a Bill for which the National Society for the Prevention of Cruelty to Children is largely responsible, and is the result of years of experience as to the necessity for amendments to the laws relating to children. It was passed, with the exception of Part III., which deals with juvenile smoking, with the practically unanimous approval of all parties in both Houses of Parliament, and this fact alone should silence those who have thought fit, with cheap sneers, to ridicule the Act, and to refer to it as another example of grandmotherly legislation.

The first portion of the Act deals with what is commonly known as baby farming, and entirely repeals the Infant Life Protection Act, 1897. This 1897 Act was an exceedingly useful one; briefly its provisions were as follows:—

Every person keeping more than one infant, under 5 years of age, for reward, or adopting an infant, under 2 years, for a lump sum exceeding £20, must within 48 hours notify the fact to the local authority, who had power to appoint inspectors to carry out the provisions of the Act, to limit the number of

infants to be nursed in a house, and to order the removal to a workhouse of a child nursed under conditions dangerous to health.

Part I. of the Children's Act is a great improvement on the repealed Act, for it includes within its provisions cases, in which one child only is maintained for hire or reward, and cases, in which a child is adopted for a lump sum paid down, whatever the amount. It also raises the age of children, included in the Act, from 5 to 7 years, and enables local authorities to remove any infant, nursed by unsuitable persons, or in unsuitable surroundings.

The first great amendment, namely, to include all cases in which only one child is maintained, is a long needed reform. It is difficult to know why the law has never dealt with single children before. Under the 1897 Act, in which single children were not included, a very large proportion, estimated by experts at 80 per cent., of babies put out to nurse obtained no protection. They could be and undoubtedly were improperly treated, badly fed, neglected, and, in many cases, done to death. Now, those taking a single child must at once notify, and the inspectors under the Act (who now *must* be appointed, it is no longer left to the discretion of the authority) will have the same powers in these cases as they formerly had in the case of persons taking more than one infant.

The only objection that I can find against the inclusion of the single child cases, is that it has been contended that it will cause a paucity of good homes, because respectable people will object to official inspection, and also that the change demanded will be raised, and thus mothers, anxious to put their children out to nurse, and finding greater difficulty, will be more likely to desert them, to kill them, or even to commit suicide themselves. It is strange that it is largely from philanthropic societies, anxious to place their children out at a low price, that this objection comes. It is quite imaginary, and, even if it were a fact, it is better to pay a little more and have efficient protection, than to pay less without protection.

The abolition of the £20 lump sum is good. Why should a woman, because she has received £25 down for the main-

tenance of a child, be exempt from inspection? The mother of a nurse infant, who can afford to pay, say, £50 down, does not necessarily place her infant with a woman superior to inspection, and undoubtedly many cases of infantile neglect and death have escaped detection on account of this £20 limit. In the future it will not be so.

The raising of the age from 5 to 7 years, and the power to remove children, nursed by improper people in improper surroundings, will improve the working of the Act, though these are nothing like so important as the first two amendments.

To anyone, who is familiar with the terrible evils of baby farming, the notorious cases, in which women have taken infant after infant and murdered them, *e.g.*, the terrible Mrs. Dyer—the less known cases in which babies are half starved and neglected—the many, many instances in which children are simply improperly treated—to anyone, to whom these abuses are known, anything which strengthens the authorities in protecting infant life, must be gladly welcomed, and there can be no doubt that the law as amended will greatly help, and ought to save suffering to, many a poor infant, whose mothers have, in the picturesque phrase of Mr. John Burns, “sublet their maternity.”

The second part of the Act deals with the Prevention of Cruelty to Children and young Persons. Of the 27 clauses, it is only necessary to refer to two at any length, but there are many others of interest in it. For instance, section 12 makes it an offence of cruelty for the custodian of a child to fail to provide adequate food, clothing, and medical aid for that child. This clause will enable education authorities to compel parents to carry out the remedying of grave defects discovered by the school medical officer, *e.g.*, to insist on parents having high or progressive myopia in the cases of their children treated, to attend to ringworm of the scalp, and so on. Up to the present, nothing has been able to be done in this matter, and if this clause is used by the authorities with discretion, it might be made very useful.

Clause 13 deals with overlaying, and reads as follows:—
“When it is proved that the death of an infant under 3 years of age was caused by suffocation (not being suffocation caused

by disease or the presence of any foreign body in the air passages of the infant) whilst the infant was in bed with some other person over 16 years of age, and that that other person was at the time of going to bed under the influence of drink, that other person shall be deemed to have neglected the infant in a manner likely to have caused injury to its health within the meaning of this part of this Act." The punishment is a fine not exceeding £100, or imprisonment for a term not exceeding two years.

In 1906, there were in England and Wales 1,500 deaths in children under one year of age caused by suffocation in bed. This is the first time that overlaying has been made a legal crime. It is to be regretted that the law does not make it an offence, even if the person who caused the death were sober, if carelessness could be proved. The practice of taking young children into crowded beds is sometimes defended on the ground of warmth, but it should be discouraged. A simple box, in which the child can sleep with safety, can be got for almost nothing. It has been frequently stated that, as a much larger proportion of overlaying cases occur on Friday, Saturday, and Sunday nights, the nights on which wages are paid and spent, drunkenness in the parents is responsible. This has not been proved; but still it is a suspicious fact, and several witnesses, in evidence before the Inter-Departmental Committee on Physical Deterioration, gave it as their opinion that drunkenness in the parents was a common cause of overlaying.

Clause 15 is devoted to the question of the burning of children, and is as follows:—"If any person over the age of 16 years, who has the custody, charge, or care of any child under the age of 7 years, allows that child to be in any room containing an open fire grate not sufficiently protected to guard against the risk of the child being burnt or scalded, without taking reasonable precautions against that risk, and by reason thereof the child is killed or suffers serious injury, he shall, on summary conviction, be liable to a fine not exceeding £10."

There are in this country, annually, from burns and scalds, 1,400 deaths of children under 5 years of age. The great majority of these deaths are, with a few simple precautions,

absolutely preventable. In addition to those who lose their lives, there is an enormous number of children who are injured in varying degrees, so that the sum total of suffering is appalling. The two most important contributory causes of this very large number of deaths and accidents from burning are : (1) the wearing of inflammable garments, (2) the absence of efficient fire guards.

The chief material, used by the poor for the under garments for children, is flannelette. It has the great advantage of being warm and cheap, and the great disadvantage of being very inflammable. But there is no substitute for it within reach of the poor. Those materials which will only burn with difficulty, *e.g.*, *good flannel*, are much too expensive. Attempts have been made to render flannelette less readily inflammable in various ways. The first of these is to impregnate the material before it is sold with some chemical. Patent materials are advertised, which are guaranteed to be practically non-inflammable, but repeated washing either gets rid of the chemical, or renders it non-efficient, so that the material burns much more readily than it originally did, sometimes as easily as ordinary flannelette, and as the cheapest variety of this material costs 6 $\frac{3}{4}$ d. a yard, and a cheap flannelette only 2 $\frac{3}{4}$ d., it is hardly to be expected that the working woman, whose income is reckoned in shillings, should pay this price for advantages so transient and questionable. The second method is to rinse the flannelette each time of washing in some solution, such as borax or some of the various patent (and therefore more expensive) preparations, such as Flameoff. This entails, each time of washing, more trouble and more expense, and, on that account, is not likely to be adopted. All garments are inflammable, some more readily (especially flannelette), some less—and the only way to prevent all this dreadful loss of life, is, by some means or other, to prevent the flames reaching the child's garments. This leads to the second contributory cause, the absence of efficient fire-guards. This fact was present in 85 per cent. of 1,600 inquests held on children dying from burns. The difficulty of getting the poorer classes to use these guards is, of course, their cost. It is the bounden duty of all district visitors, nurses, and others, who come into contact with the poor, to impress upon them, on every possible occasion, the great danger, which their

children run, by being left in rooms with unprotected fires. The best method of prevention, that has been suggested, is that an addition should be made to the building byelaws of every council, rendering it compulsory to fix fire-guards to every open grate in any new building under a rental value, say, of £26 per annum. This figure is suggested, because it would not be necessary to compel the fixation of guards in the better class of houses. This is already voluntarily done by the parents in almost all cases, and, in addition, they usually have nurses to look after their children. As a matter of experience, it is practically always among the poor, where parents cannot leave anyone in charge, that the deaths from burning occur. This byelaw would add practically nothing to the cost of a house—the amount is estimated at about $\frac{1}{2}$ per cent. of the cost by building experts, and is a perfectly practical and reasonable suggestion, and one which, if universally adopted, would save many lives, and much suffering.

Part III., the only portion of the Act which has anywhere met with opposition, deals with juvenile smoking. It makes it an offence to sell tobacco to children under 16, and makes it the duty of constables to seize and confiscate cigarettes in the possession of any one under 16, found smoking in a public place. It is impossible to ignore the mass of opinion of those who have had opportunities of judging of the harmful effects of tobacco smoking in the young. The Report of the Inter-Departmental Committee on Physical Deterioration was very conclusive. "The evidence submitted on the point represents a practically unanimous opinion that the habit of cigarette smoking among boys is a growing one, and that its consequences are extremely deleterious. No actual testimony was forthcoming to prove that early smoking diminishes growth, but Professor Cunningham mentioned it as one of the causes of physical deterioration, and Dr. Scott was of opinion that scarcely 2 per cent. of cases of undergrowth had not been habitual cigarette smokers. The experience of a schoolmaster at Langton was quoted to show a distinct inferiority of physique in the case of boy smokers, as against non-smokers, and Mr. Atkins adduced evidence from Colonel Leetham, the late Chief Inspector of Recruiting in Manchester, who has said that "perhaps a third of the rejects from the army in

Lancashire might be attributed to smoker's heart." This is no doubt an excessive estimate, but it shows one bad consequence of early smoking, and it is common knowledge that smoking affects the wind and general physical capacity.

This clause will frighten, if not suppress, the juvenile smoker. It will make it more difficult for him to obtain his cigarettes, and a habit, specially injurious to the young, will be frowned upon with the authority of the State.

The subject of alcohol is referred to in several clauses of the Act. For instance, by section 26, if a parent guilty of cruelty to a child is a habitual drunkard, the court may, instead of imprisonment, send the parent to a retreat for a period up to 2 years. Section 14 provides that anyone may bring before a petty sessional court any person apparently under 14 years of age who is under the care of a parent, who, by reason of drunken habits, is unfit to have the care of a child, and the court may send the child to a certified industrial school, if satisfied as to the facts. Section 119 says that anyone giving any intoxicating liquor to a child under 5 years of age, except under the direction of a doctor, or in the case of sickness, or apprehended sickness, or other urgent cause, shall be liable to a fine not exceeding £3. In the comparative seclusion of the bar, thoughtless and ignorant women frequently do not hesitate to give small doses of liquor to their children, but, forbidden now to do so, they will recognise the shame of initiating their offspring into drinking habits in the public street, which is the only alternative. The awful spectacle of a mother, feeding her child on sips of gin or beer, in a bar full of rowdy men is banished. Section 120, the most important one dealing with alcohol, perhaps one of the best clauses of the whole Act, forbids the holder of a licence of any licensed premises, to allow a child to be in the bar of licensed premises, the bar being defined as "any open drinking bar, or any part of the premises, exclusively or mainly used for the sale and consumption of intoxicating liquor." This is a splendid provision. It prevents children from getting accustomed to the foul language and the general degradation of the low class public house. It is a very unfortunate thing that many publicans are attempting to defeat the clause, by suggesting children's rooms at public houses,

where the children may remain, whilst their parents drink. They will find in this case that both the law and public opinion are a little too strong for them. There are licensing magistrates to deal with, and they have of recent years, especially, shown themselves as a body very strongly committed to the cause of temperance.

These few clauses show the great value of this important measure. The whole Act is full of provisions for bettering the condition of child life, and is certainly one of the most important and useful measures placed on the statute books for many years. It has been received with a joyful welcome by all sections, and great things are hoped from it. It now rests with the various authorities to see that it is properly carried out. If this is done, there can be no doubt that these hopes will be speedily realised.



MEAT AS A SOURCE OF INFECTION IN
TUBERCULOSIS.¹

By ARTHUR R. LITTELJOHN, M.R.C.S., L.R.C.P., M.R.C.V.S., D.P.H.

WHAT is meant by the term "Meat"? As used in this paper the term includes not only the flesh but all parts of the animal body that are utilised for human food. Most parts of the animal body are used for human food, for amongst the poor the liver, lungs, udder, and mesentery are eaten.

WHAT "FOOD ANIMALS" ARE AFFECTED WITH
TUBERCULOSIS?

All our "food animals" are liable to infection.

Cattle.—About 20 to 30 per cent. of our cattle are to some extent tuberculous. Young cattle up to one year old are rarely affected (about .05 per cent.), but the percentage increases with each year of life, and, in old milch cows, ten to fifteen years old, it may reach 75 per cent.

Pigs.—About 4 to 5 per cent. of our pigs are tuberculous. Seeing that in pigs tuberculosis tends to generalise so rapidly, they are quite as serious a source of danger to man as cattle, although a smaller percentage are affected.

Birds.—It is difficult to give even a rough estimate of the percentage of cases of tuberculosis in fowls, but the disease occasionally becomes a plague, for the stamping out of which destruction of both fowls and buildings is necessary.

Other domesticated birds, turkeys, ducks, and confined pheasants, are occasionally affected. Avian tuberculosis is, no doubt, the same disease as mammalian tuberculosis, but elaborate methods (*viz.*, repeated passage through animals) are necessary in order to infect fowls with human tuberculosis.

According to Nocard, avian tuberculosis is not transmissible to man.

Sheep and Goats are rarely affected (about .002 per cent.).

Rabbits are very susceptible to experimental infection, but are rarely attacked naturally, even when kept in confinement.

Horses in this country are not much used for human food,

¹ Read before the National Tuberculosis Conference in London.

and in them tuberculosis only occurs in about 1 per cent.

It will thus be seen that cattle and pigs are the only "food animals," in the consumption of whose flesh there is any serious danger of tuberculosis being transmitted to man. It is not surprising, therefore, that most of the investigations, concerning tuberculosis from eating meat, have been made on cattle and pigs.

CAN MAN CONTRACT BOVINE TUBERCULOSIS ?

Von Behring, in his Cassel Lecture (1905), stated that he believed that the source of infection with tuberculosis, in adult human beings, was an infantile contraction of bovine tuberculosis through feeding children on milk, and that the tuberculosis remained latent until re-started in adult life.

Ravenel, in 1905, pointed out that the bovine tubercle bacilli had a much greater virulence on other animals than had human tubercle bacilli, and he argued that it would be remarkable, seeing how susceptible man is to tuberculosis, if he were immune to the more powerful virus.

Koch, in his Nobel Lecture, 1906, stated that he believed that bovine tuberculosis was not transmissible to man, but qualified his statement by saying that, at any rate, generalised tuberculosis, and, above all, pulmonary tuberculosis of man was never the result of transmission of bovine tuberculosis.

The generally accepted view now is that human tuberculosis may be, and is caused by bacilli of either bovine or human origin.

The Royal Commission, in its second interim report, 1907, confirmed the conclusions come to by various individual investigators that there is a bovine and a human type of tubercle bacillus, and that these are distinct and recognisable.

Theobald Smith had previously (1898) obtained two types of tubercle bacilli from the mesenteric glands of children, one type of which conformed to the distinctive tests of bovine tubercle bacilli. In a later paper (1905), he also quotes other authorities, who had obtained the bovine type from man.

The Imperial Board of Health in Berlin, under Kossel (1905), records finding bacilli of the bovine type six times in fifty-six cases of human tuberculosis. These results were, with one exception, obtained from the mesenteric glands, or

intestinal ulcers of children. The sputum of tuberculous adults, however, invariably contained the human type only.

The Royal Commission, in its second interim report, 1907, found that ten out of nineteen cases of primary abdominal tuberculosis, three out of eight cases of tuberculous cervical glands, one out of four cases of tuberculous sputum, and none out of ten cases of tuberculous lungs in human beings were due to bacilli of the bovine type.

Primary tuberculosis of mesenteric and cervical glands causes less than 10 per cent. of the total mortality from tuberculosis in this country, and, from the foregoing, it will be seen that about half (thirteen out of twenty-seven) of these are bovine in origin. We may therefore assume that 5 to 10 per cent. of the human mortality from tuberculosis in this country is due to infection from bovine sources.

INFECTION BY INGESTION IN MAN.

Experiments have shown that ingestion, as a means of infection in tuberculosis, requires the swallowing of large numbers of tubercle bacilli, unless the intestinal mucous membrane is not intact, in which case a small number will often suffice. The great rarity of primary tuberculosis of the tongue, oral cavity, and alimentary tract, generally in adults, and the comparative infrequency of primary tuberculosis of the mesenteric glands, except in children, indicate that ingestion, as a means of infection in adults, is rare. The comparative absence of primary tuberculosis of the mesenteric glands in adults is important, for experiments have shown that, unless large numbers of tubercle bacilli are ingested, the intestinal mucous membrane often escapes any local lesion, whilst the mesenteric glands become infected (Sidney Martin).

The presence, however, of abdominal tuberculosis is apparently not essential in all cases of tuberculosis from ingestion. Calmette's and Guérin's experiments led them to believe that tuberculosis of the bronchial glands and lungs could result from feeding with tuberculous material, without any intestinal, or mesenteric lesions being found.

Latham, in confirming Woodhead's work, showed that tubercle bacilli were present in the tonsils in seven cases out of forty-five consecutive children examined. Active tuber-

culosis of the tonsils is seldom seen, but the harbouring of tubercle bacilli by the tonsil probably precedes, and leads to, many of the tuberculous cervical glands in children. By spreading down from these along the lymphatics of the neck, the tubercle bacilli reach the bronchial glands, and have been found to originate in this way an attack of pulmonary tuberculosis. That this is a commoner occurrence than is usually believed is suggested by the frequency with which pulmonary tuberculosis in children starts near the root of the lung adjacent to the bronchial glands.

The fact, however, that, during a period in which the use of meat as human food has greatly increased, human tuberculosis has greatly declined, suggests that meat is not a serious source of infection (Royal Commission).

The comparative frequency of the alimentary origin of tuberculosis in children, who ingest more unboiled cows' milk than do adults, indicates that milk, rather than meat, is the usual source of infection by ingestion.

DISTRIBUTION OF TUBERCULOUS LESIONS.

In Cattle.—The commonest seats of tuberculous changes are (1) the bronchial and mediastinal glands, (2) the lungs and pleura, (3) the peritoneum, mesenteric glands, liver, pharyngeal glands, udder, and kidneys, more or less in the order given. In about 50 per cent. of all cases of tuberculosis, the lungs, with their lymphatic glands, and the pleura are simultaneously affected. In about 30 per cent. the lungs and their lymphatic glands are alone affected. In about 20 per cent. the serous membranes alone are affected.

In the adult ox, the spleen itself is almost exempt from tuberculous changes, although its peritoneal covering suffers as frequently as the rest of the peritoneum. In very advanced cases, the intestines and uterus may be involved, and occasionally the bones are affected. But tuberculous lesions in the muscular tissue itself are very rare.

In Pigs.—The method of infection being almost always by ingestion, the lesions are, as one would expect, almost constantly in some part of the alimentary tract. Not, as a rule, till generalisation occurs (and there is a great tendency to rapid generalisation in the pig) are the lungs seen to be affected. The most frequent seats are the tonsils and the glands of the throat, but the small intestine and mesenteric glands are also

commonly affected. The bones, particularly the vertebræ, are more frequently affected in pigs than in cattle, but muscular lesions are rare.

THE FLESH OF TUBERCULOUS CARCASSES.

As the result of numerous experiments, it is generally believed that, except in the case of local extension, the flesh is only dangerous whilst tubercle bacilli are circulating in the blood. If there is a miliary tuberculosis of the organs this certainly has occurred, and investigations teach us to suspect its occurrence (1) in the acute stages of tuberculosis ; (2) when foci have softened and become purulent, or when there are actual cavities containing pus ; (3) when a tuberculous lesion has encroached upon and caused ulceration of the intima of a blood-vessel or the thoracic duct. In all these cases, it is probable that tubercle bacilli have occasionally gained access to the general circulation, and in such cases the flesh is, or has at some time been, dangerous.

Demonstrable naked eye and even microscopic lesions are exceedingly rare in the muscular tissue, except by local extension from a tuberculous bone, joint, or gland. Animals have been fed on flesh from tuberculous carcasses by many experimenters, but when nothing except flesh has been given, positive results are few, even when the carcasses of animals, that had suffered from generalised tuberculosis, supplied the meat substance.

(1) Nocard records having infected one of four guinea-pigs, by intraperitoneal inoculation, with muscle juice from 21 cows affected by generalised tuberculosis. The flesh of the cows that caused infection, however, failed to infect any of four cats fed on it.

(2) Galtier records similar experiments where he fed cats, dogs, and pigs with as much flesh from tuberculous cattle as they would eat. No case of tuberculosis resulted, although samples from two of the carcasses contained muscle juice that infected with tuberculosis, rabbits which were inoculated subcutaneously.

(3) Recognising that infection by ingestion was difficult, Van der Sluys fed 10 young pigs with flesh from animals suffering with acute generalised tuberculosis, adding bone splinters to it. Three of the 10 pigs developed tuberculosis.

(4) Gerlach records feeding pigs with flesh from a tuber-

culous sheep, and finding that two developed tuberculosis.

(5) Peuch records three positive results when inoculating three rabbits with the muscle juice from a fowl that died of tuberculosis.

Experiments have been uniformly positive when the muscle juice from human beings, dead of phthisis, has been used.

Although there are a few contradictory inoculation experiments, the majority have shown that in cattle, even in advanced cases of tuberculosis, and in generalised tuberculosis, the muscular tissue itself is very rarely infective, even with such a delicate test as the inoculation of raw muscle juice into the peritoneal cavity of guinea-pigs. Many of the positive results have been accounted for by contamination of the muscular tissue, during its removal from a tuberculous carcase. This almost constant absence of tubercle bacilli in the muscular tissue has been accounted for by the acidity of muscle being unfavourable for their growth. It is possible, however, that when tubercle bacilli are circulating in the blood, the capillaries of various organs have a greater selective power for them, and, as a result, few are arrested in the capillaries of the muscles. (McFadyean.)

McFadyean and Nocard have both shown that, within a few hours of injecting large numbers of tubercle bacilli into the circulation, the muscles fail to contain any, while the blood itself is free in three to six days.

Even in pigs, in which generalisation is so frequent, experiments fail to demonstrate tubercle bacilli in the muscle. Positive results have, however, been more frequent when using the muscle of tuberculous pigs, sheep, and fowls instead of cattle.

From the foregoing, we may conclude that the flesh of tuberculous animals is not necessarily infectious. In many, if not the majority of, cases when the flesh is infectious, this is the result of contamination by means of the knife, butcher's cloth, etc. This occurs during the dressing of the carcase, from either the carcase itself or one previously dressed. It has previously been stated that large numbers of tubercle bacilli are necessary to infect by ingestion, and, seeing that in the majority of cases tubercle bacilli are absent altogether from the meat, the occasional positive result obtained by inoculating a guinea-pig

intraperitoneally does not justify us in saying that the meat would have infected man had he eaten it. It has been stated that Hebrews suffer less than other races from tuberculosis, because of the more careful selection and supervision of the meat they eat. Such statements are incorrect and have been shown to be so by numerous authorities. The occasions, in which tubercle bacilli are liable to gain entrance to the general circulation, have already been indicated. In such cases one should look for tuberculous foci of varying ages in the liver, spleen, and kidneys. The intermuscular lymphatic glands would at the same time be affected, and would show more advanced lesions than those in the organs. Foci, in fact, may be found in these glands before they are even evident in the organs. In suspected cases, therefore, these glands should be microscopically examined, and the carcase judged accordingly. To remove all the intermuscular glands before the flesh is allowed into the market would be impossible. Although, the flesh itself is not infective, its glands make it dangerous. Besides the flesh there are other parts of the animal body that are eaten. Most of the internal organs are a common form of diet, whilst the poorer classes eat the lungs, udder, and mesenteries. All these organs are often highly infective in a tuberculous carcase, and are therefore a source of danger to man.

INSPECTION OF CARCASE.

From the foregoing it will be seen how essential is a proper system of meat inspection. Unfortunately, under present conditions in Great Britain, the stringency or laxity of the inspection, instead of being statutory, rests with the sanitary authorities, or those persons appointed by them. As a result there is doubtless much tuberculous "meat" reaching the market.

Take, for instance, a district in which the inspection of meat is thorough, whilst in neighbouring districts it is purely formal. What results? Cattle, instead of being slaughtered in the district well inspected, where seizure would be almost certain, are slaughtered in an adjacent district badly inspected, and the carcasses sent to market in the otherwise safe district. This is probably happening all over the country, and will continue to happen, until comprehensive regulations are made, and enforced by statute throughout the

country.

The Royal Commission made certain recommendations which are adhered to in some parts of the country, and quite ignored in others.

The recommendations for tuberculous carcases of cattle were :—

The entire carcase and all organs may be seized—

(a) When there is miliary tuberculosis of both lungs.

(b) When tuberculous lesions are present in the pleura and peritoneum.

(c) When tuberculous lesions are present in the muscular system, or in the lymphatic glands embedded in or between the muscles.

(d) When tuberculous lesions exist in any part of an emaciated carcase.

The carcase, if otherwise healthy, shall not be condemned, but every part of it containing tuberculous lesions shall be seized—

(i) When the lesions are confined to the lungs and the thoracic lymphatic glands.

(ii) When the lesions are confined to the liver.

(iii) When the lesions are confined to the pharyngeal lymphatic glands.

(iv) When the lesions are confined to any combination of the foregoing, but are collectively small in extent.

Whilst for tuberculous carcases of pigs, they recommended complete seizure, in all circumstances, on account of the great tendency to generalisation. But an inspection, improperly carried out, may do more harm than good. The inspector, for instance, if he is not careful during his examination, may contaminate sound parts of the carcase with tuberculous material. Bearing in mind the possibility of contamination in this manner, one should, so far as possible, examine those organs which appear healthy, before cutting into those obviously diseased, and, having examined one carcase, should use a fresh knife, etc., or boil those used, before examining the next carcase.

Roughly speaking, the examination should be made on the following lines :—The head having been removed and the carcase halved, begin the examination at the hind-quarters and work forward to the head and neck.

(1) Examine the meat substance, and, in the hind-quarters, the lymph glands for that area, *i.e.*, popliteal, precrural, and inguinal.

(2) If the peritoneum appears healthy, examine next the iliac, and other retroperitoneal lymph glands. If obviously diseased, leave these glands till later.

(3) Examine the vertebræ, ribs, and sternum.

(4) Examine the prescapular and axillary lymph glands.

(5) If the pleura appears healthy, examine the sternal and intercostal lymph glands.

(6) Examine the mesenteric lymph glands, the udder, kidneys, spleen, liver, and lungs with their lymph glands, in that order.

(7) Examine the head, and the submaxillary and retro-pharyngeal lymph glands.

Always avoid cutting into tuberculous foci until the healthy parts of the carcase have been examined.

THE EFFECTS OF COOKING ON TUBERCLE BACILLI.

Large numbers of experiments have been carried out to show the power of resistance of tubercle bacilli to heat, and the results show that it is moderate. Ten minutes at 75° C. is said by Jersin to be sufficient to destroy the vitality of tubercle bacilli; whilst experiments by Forster show that fifteen minutes at 65° C., ten minutes at 70° C., and one minute at 95° C. are sufficient. Schmidt Mulheim found that, without exception, tubercle bacilli lost their virulence at the coagulation temperature of albumen.

More to the point are the experiments of Woodhead for the Royal Commission, given in Report i., 1895. Working on the hypothesis that the flesh of tuberculous animals was rarely, if ever, infective, unless soiled during dressing of the carcase, he artificially infected the flesh before experimenting. In some cases, he injected tuberculous material into the interior of the meat substance, and, in others, he smeared slices of meat and formed them into "rolls." The latter experiment is of importance, as it is the custom for butchers to make such "rolls," and they frequently include minced lungs, omentum, etc., structures which are often highly virulent. Having subjected his samples to the ordinary processes of cooking, and noted the temperature at various

depths below the surface, he took the central portions of them for feeding and inoculating animals.

The conclusions he came to were :—

(1) The centre of a “joint,” weighing 6 lb. or over, never reached a higher temperature than 60° C. (140° F.) during ordinary cooking.

(2) “Rolls” of meat of more than 3 lb. or 4 lb. weight were not rendered sterile throughout, and therefore cooking could not be relied upon to render innocuous “rolls” with smeared tuberculous centres.

(3) Ordinary cooking was sufficient to destroy any smeared tuberculous material on the outside of a “joint” or “roll.”

(4) The most trustworthy method of cooking is boiling, then roasting in an oven, and the least trustworthy, roasting in front of a fire.

THE EFFECTS OF PRESERVATIVES ON TUBERCLE BACILLI.

(1) Forster sprinkled pure cultures of tubercle bacilli with sterilised common salt, and found them virulent two months later. (2) He found, also, that finely minced tuberculous organs, after lying in salt brine for eighteen days, retained their virulence. (3) That salting and subsequent smoking did not render the tuberculous organs innocuous, unless these are smoked for three to five hours, on three different occasions, or, after smoking, are kept in a dry room for one or two months.

THE EFFECTS OF DIGESTION ON TUBERCLE BACILLI.

The gastric juice, being acid, has no doubt a retarding influence on the growth of tubercle bacilli, but it is not, during digestion, in contact sufficiently long to destroy them. Falk and Wesener exposed tuberculous material to artificial gastric juice for some hours, but it was still virulent when tested by the inoculation of animals. Strauss and Wartz showed that six hours in the gastric juice of a dog did not destroy the vitality of tubercle bacilli, but that twenty-four hours were needed. (During the process of digestion three or four hours is probably the longest time any portion of a meal will remain in the human stomach, and much of the food will pass out in a shorter time.) Newsholme suggests that the fatty envelope of tubercle bacilli would probably be

dissolved easier in the stomach than under artificial conditions, as the fat-splitting enzyme of the gastric juice is very sensitive to its environment. Stern has demonstrated that the intestinal juice has no effect on tubercle bacilli.

We may, therefore, safely consider (1) that digestion, or salting, or smoking (as usually carried out) has little or no disinfecting effect on tuberculous meat; (2) that, owing to the rarity of tuberculous foci in the flesh, even in the most advanced cases of tuberculosis, ordinary cooking is sufficient, as, with the exception of contaminated "butcher rolls," contaminated meat is thus rendered innocuous. With a more efficient "meat inspection" the quantity of tuberculous organs reaching the market would be reduced to a minimum.

On the strength of what has gone before we may conclude :—

(1) That man can contract tuberculosis from cattle, but that, considering the difficulty experienced in transmitting human tuberculosis to cattle, we may, perhaps, assume that the transmission of bovine tuberculosis to man is also difficult to effect.

(2) That infection of man with tuberculosis is not commonly caused by ingesting meat, since it requires the swallowing of large numbers of tubercle bacilli to be effective.

(3) That the flesh of tuberculous animals (even in generalised tuberculosis) is rarely infective, except as a result of *post-mortem* contamination.

(4) That the ordinary processes of cooking, in the majority of cases, are sufficient to render the contaminated meat non-infective.

(5) That during a period, in which the consumption of meat by man has increased in quantity, human tuberculosis has declined (Royal Commission).

We may justly infer, therefore, that, to the community at large, the risk of contracting tuberculosis by eating the meat of tuberculous animals is not so great as is generally believed; but that this risk is greater than it should be, owing to inefficient methods of inspection. This imperfect inspection particularly concerns those that buy cheap meat, and eat such commonly infected organs as the lungs, udder, and mesenteries.

SOME CLINICAL ASPECTS OF CASES ACCOMPANIED
BY INCREASED BLOOD PRESSURE.

By H. O. BUTLER, B.A., M.B., B.C.,

CONSIDERING the mechanics of the circulatory system, it is evident that increased pressure, considering only the arterial system, may show effects at the heart, or along the mains or their tributaries. Take the case of the heart first. The obvious example, showing all the manifestations of increased pressure, is chronic Bright's disease. Clinically, however, one comes across cases, which are not what is commonly called Bright's disease in their total absence of albumen or tube casts, and yet show similar manifestations of an analogous pathological state.

Case 1.—A middle-aged plethoric woman, who complains of feelings of giddiness, usually coming on after going to bed, after a rather harder day's work than usual. Examination revealed nothing but rather feeble heart sounds, and an arterial pressure about normal. Treatment consisted of small doses of digitalis. During the next two months, the number of attacks increased, until one night I was sent for in a hurry, and found the patient in bed, but feeling so giddy that she was unable to move her head. Her pulse, however, was full and strong, and the arterial pressure 170 mms. Hg. This appeared to give the key to the problem. An extra hard day's work in a woman, not accustomed to exercise, had released an accumulation of waste products, which caused the brain irritation manifesting itself in giddiness. The treatment advised consisted of purges, and so far as possible a purin free diet. These effected rapid improvement, but a slight relaxation of diet was sufficient to cause a return of the symptoms.

This case well exemplifies the ease with which one can be led astray simply from not realising the pathological conditions obtaining. Treating the symptoms only, the rather embarrassed heart, did more harm than good. Treating the pathological condition underlying promptly altered matters.

Of greater interest, however, because less commonly recognised, are those cases, which show the results of a raised arterial pressure affecting local areas. For the purpose of this paper local area means brain; though it seems to me that similar reasoning, applied for instance to Raynaud's disease, or to intermittent hæmoglobinuria, would be of interest.

Case 2.—A middle-aged spare man, who has "done himself well" all his life. I found him quite unconscious with stertorous breathing, eyes

squinting to the right, and the right side of the face and right arm twitching violently. His pressure by the Riva Rocci manometer was 280 mms. Hg. I bled him one pint, after finding that chloroform only stopped the "fits" temporarily. The next day, I found him with the right side of the face and the right arm showing slight muscular weakness, and a complete inability to call objects by their right names. These symptoms completely cleared up in 10 days. A history of syphilis was elucidated, and an energetic course of 6 months' treatment tried with no good result whatever. In about a month another exactly similar attack occurred, with the exception that the muscular weakness and aphasia cleared up more quickly. This patient has had so far seven similar attacks, each milder than the last, during the last 18 months. In the first four, he required bleeding, as I was afraid of an artery rupturing under the strain. In the next two, chloroform and morphia answered alone, the latter in $\frac{1}{4}$ grain doses twice repeated in each case. In the last attack, one dose of $\frac{1}{4}$ grain, and no chloroform sufficed. In view of the fact that the patient stated he had had energetic antisiphilitic treatment quite apart from what I gave him, I think this disease may be excluded. What then was the condition obtaining? The complete organic recovery negatives organic or macroscopic damage. It is difficult to imagine any other condition than a toxic outburst which fits in with the facts. In this patient, a history of slight gout was obtained, and a similar treatment was tried. The gradual lessened severity of the attacks seems to indicate that the view taken was the correct one. The treatment again consisted of purging, and a purin free diet, and attempts at obtaining gastro-intestinal antiseptics.

In this case, I tried to make use of the manometer as an autotoxicity barometer; the idea being that, as toxins increased in the blood, the capillary vasomotor system was irritated. After each attack, the arterial pressure was low for this particular patient, *e.g.*, 140–150 mms. Hg. when he was not bled. The pressure gradually, with fluctuations, increased until it reached 280 mms., and another attack occurred. Twice in this patient, I was able to foretell an attack solely by the readings of the manometer. The fourth attack was quite unexpected. Apart from slight irritability, the patient seemed quite well, and his pressure was 170 mms. In a couple of hours, this had risen to 280 and the attack occurred. The raised pressure is obviously only one of the symptoms of the toxic condition of the blood, and the suddenness of the attack seems comparable with a gouty outburst in a joint.

Case 3.—A spare woman aged 70. Her attacks consisted of sudden vomiting, then loss of consciousness and epileptiform twitchings, followed by transient aphasia and muscular weakness. The pressure, on the only occasion on which I was allowed to take it in an interval between two attacks, was 290. Treatment consisted of inhalations of chloroform and injections of morphia during the attacks, and the usual purgings and purin

free diet in the intervals, in this case, to as great an extent as I was allowed, which was not much. Of the three attacks, in which I have seen her, the last has been much the most severe; but I found that her relatives considered I was "lowering" her too much, and had fed her up with beef tea, etc. She had been given bromides by a previous medical attendant, and, as she expressed herself greatly benefited by them, I was induced to try them. In Case 2, I found that three doses of 30 grains at three hour intervals would lower his pressure 45 mms. Hg. I used the potassium salt, but the metallic ion was evidently not, at any rate, the only cause of this, as potassium iodide had no effect.

Case 4.—A man of 55, a teetotaler and non-smoker, came complaining of slight difficulty in writing and speaking certain words. His pressure was 190. Bromides, dieting, and purging lowered this to 140, and I lost sight of him for two months. A short time ago, he came saying that he had remained quite well until the previous day, when he had had a deal of mental work to do at certain meetings. As soon as this was over, he was noticed to become strange in his manner, and to attempt to turn out the electric light at the globe instead of at the switch. He was due to arrive home at 7 p.m. He remembered getting out of the train, and the next thing he can recollect is arriving home covered with mud at 2 a.m. with a bruise on his face and without his ring and umbrella. He recollected walking about in a confused way, but could not remember who he was or where he lived, until memory suddenly returned, and he found himself close to his home. I noticed on the next evening, that one side of his face was smoother than the other, and that he could not speak many words plainly. From a knowledge of his previous attack, I have little doubt that he was in something similar to a post-epileptic state during these adventures.

Another case gives a history of an attack of unconsciousness lasting 14 days, about a year ago. So far as I could gather, he improved after removal of some fluid from the spinal canal. At the present time, his pressure is about 180, and he has shown evidences of threatening attacks of "fits," which appear to have been avoided by treatment. In one of these, the pressure rose to 220 mm. Hg., and the attack commenced by a blurring of speech rather than aphasia, together with paralysis of the left side of the face, the right arm and the left leg. The usual treatment cleared the affair up in three days.

Summing the matter up:—There appears to be a condition obtaining in middle aged and elderly people, characterised by a high blood pressure, a tendency to irritability or moroseness, and sudden apoplecticiform, or epileptiform, attacks, which leave more or less transient nervous symptoms, often aphasia and localised paralyses.

In all the cases mentioned, a history of epilepsy was absent. In only one was there a history of syphilis, and this had been

energetically treated, and in no case was there ever found either albumen or tube casts. These symptoms appear to be explicable only by the idea of a toxic outburst occurring in persons with deficient elimination. How this toxic condition acts, it is difficult to say, possibly by causing spasm of localised arterioles, or perhaps a more highly developed nerve centre is more easily poisoned than a lower. The analogy of Raynaud's disease suggests the former as the more probable explanation. If this is borne in mind, the line of treatment to be followed is obvious. The treatment of uræmic states sums it up. If the toxins are believed to be manufactured in the intestinal tract, an attempt at antisepsis is indicated. I have tried most of the artificial antiseptics with little benefit, though benzo-naphthol certainly relieves the intestinal flatulence of which many patients complain. Keeping the skin acting, frequent and varied aperients, especially the salines, diuretics, and suitable diet appear to be the most important remedies at our disposal, and, when occasion requires, dulling the over-excitible centres by small regular doses of potassium bromide and exhibition of the various forms of the nitrites. Should these not suffice, and an attack appear imminent, bleeding, inhalations of chloroform, and a hypodermic of morphia may be required. This last, one would hesitate to use, if the pathology of the disease suggested is correct. Experience proves that it is well borne; and there does not appear to be any tendency for another attack to occur shortly after its use, or the interval between two attacks to be less, when it is used, than when other measures alone are made use of.

It may, I think, be well to point out that none of these cases, with the exception of (2), showed any evidence of what is commonly called arterio-sclerosis; and in this case the mode of life, coupled with long residence in a tropical country, would be sufficient to account for the slight degree observed, quite apart from any which may have been caused by the toxic condition. That arterio-sclerosis should ultimately develop is natural, but I do not think these cases should be considered as being due to that disease.

SYSTEM FOR THE MEDICAL MAN.

AMONGST the numerous and varied duties of the medical man, none call for more attention than the recording of accounts, planning of calls, and other clerical duties. After a hard day's visiting, there is something rather irksome in having to sit down before a number of account and record books, something very troublesome in having to attend to what might be termed "unproductive" labour.

Of course this part of the day's routine cannot be abolished, but it *can* be simplified, and rendered far less onerous by the introduction of simple methods. In these days, we naturally turn to see if the modern labour-saving systems adopted by commercial men will help us out of the difficulty, and, after careful consideration, it will be seen that all information, from the recording of visits to the entry of items in the ledger, can be maintained with the least possible amount of trouble, by the use of the Card Index. Doubtless there are many medical practitioners, who do not know what this system is, but, as it is very simple, the working can be understood after a brief glance.

Thin cards are placed standing on edge, in a drawer or tray, between stiff cards with a raised tab or projection, which are called "guides." On the tab the index is placed, which may be numerical or alphabetical. Thus any data can be found at once on the record card, behind its proper guide. Instead of turning over scores of pages to locate a client, say Brown by name, all that has to be done is to look behind the guide bearing the letter B and the required card will be found *at once*.

After this brief illustration of the method, in which the cards are placed, it will be well to see how the medical man can be helped to maintain all his information connected with his profession, without any trouble.

A good outfit for a complete system will consist of the following:—

1. A four-draw card-index cabinet having compartments for:—

- (a) Lists of patients.
- (b) Diagnoses.

(c) Specific diseases.

(d) Accounts.

2. A card-index tray, for use in the consulting room, divided into five sections as under :—

(1) Matters for immediate attention.

(2) Visiting list, being a set of daily and monthly guides, behind which are filed the visiting cards, and any other memoranda in proper order of date for attention. (Consultations can be recorded in the same way.)

(3) Notes for prescriptions, etc.

(4) Charges to accounts.

(5) Supply of blank cards.

Regarding procedure, this is simple to a degree.

Assuming that the system is being started for the first time, the name of the patient is entered on the visiting or consulting card. On this will be entered particulars of diagnosis, prescription, cash received, or charges to be made.

If a visit to the patient is required, the card should be marked with the date of visit and filed in section (2) of the consulting-room tray, behind the guide bearing the required date. By the removal of one guide each morning, every visiting or consultation card will come up automatically for attention on the right date, the cards for visits being then removed from the tray, and carried by the doctor on his round. For convenience they can be arranged in his pocket-wallet in order of calls, by which means the journey is quickly mapped out.

At the time of the visit, or call, from the patient, the doctor makes his notes on the visiting card, and, if medicine is required, he places the card in section (3) of the tray, whence it will be removed by the dispenser, who, after making up the medicine, files the card forward to the date of next visit. If *no* medicine is required, the doctor himself should file the card forward to the date of the next visit, or, if the treatment is finished, the card is placed in section (4) of the tray, whence it will be ready for posting to the ledger card.

As soon as charges have been posted to account, a brief summary of the treatment is entered on a diagnosis card, and is filed in B division of the cabinet. This division then forms a complete history of all diseases for which each patient

has been treated, ready for *instant* reference when required.

A further card may be written up and filed in the "Specific Diseases" section, this forming a valuable work of reference when again treating similar cases, the cards being classified behind guides bearing the names of the different diseases.

Indicators, in the shape of coloured steel signals, will be found most useful for the classification of accounts, these can be obtained in various colours, for instance, by attaching a blue indicator to a card, it is shown to be an overdue account, and a red signal, that it has been placed in the hands of the collector, whilst further colours may be used for other forms of distinction.

The complete system has now been outlined with the exception of section (1) of the consulting-room tray. This is used for holding cards bearing memoranda of matters for *immediate* attention, thus urgent business is kept well to the *front*, apart from that which may be dealt with later on.

In conclusion, it may be pointed out that the system, mentioned here, is not in any way arbitrary, but can be modified to suit the requirements of every class of medical practitioner, for while divisions (b) and (c) are valuable adjuncts they are not an *essential* to the system. No matter, however, whether one drawer be used or four, it will be found that the labour of clerical work is reduced to a minimum, and the mind of the medical man left free to consider the more important problems of his profession.

The card index is already being used largely for all kinds of records in many of our hospitals, so that it will not be altogether unfamiliar to many readers, who perhaps had not previously realised that its adoption would be to the advantage of the professional man.



Notes from Foreign Journals.

LOCAL TREATMENT OF NEURALGIA.

Lemoine publishes in the *Nord médical* several prescriptions of topical applications, which can be used with advantage to relieve neuralgia. In the so-called rheumatic neuralgia, salicylate of soda is given internally, while, locally, applications are made of salicylate of methyl, or of Bourget's ointment:—

℞ Acid Salicyl.,
Ol. Terebinth.,
Lanolin - - - - - Partes æquales.
Misce. Fiat unguentum.

If there is reason to suspect the gonococcal nature of the affection, this liniment should be used:—

℞ Guaiacol - - - - - ʒss.
Methyl. Salicylat. - - - - - ʒiiss.
Ol. Hyoscyami - - - - - ʒiij.

Misce. Fiat linimentum. Bis quotidie utend.

The following may also be used:—

℞ Guaiacol - - - - - ʒss.
Tinct. Belladonnæ - - - - - ʒiiss
Ol. Hyoscyami - - - - - ʒj.

Or,

℞ Methyl. Salicyl. - - - - - ʒiiss.
Guaiacol - - - - - ʒss.
Paraffini Liquidum - - - - - ʒiiss.

For internal administration, phenacetin is particularly useful.

℞ Phenazoni - - - - - gr. v.
Phenacetini - - - - - gr. iiij.
Quininæ Valerianat. - - - - - gr. iiss.
Caffeinæ Citrat. - - - - - gr. iss.

for one cachet.

One or two to be taken daily.

Hirtz combines acetanilide with valerian:—

℞ Phenacetini - - - - - gr. iss.
Acetanilidi - - - - - gr. iiij.
Quinin. Valerianat - - - - - gr. iv.

FOR SWEATY HANDS.

Monin advises for the relief of this form of hyperidrosis—which is distressing to the patient and may prevent him from exercising some professions—the use of the following:—

℞ Formaldehydi - - - - - ʒv.
Extracti Hammelidis Liquidum - - - - - ʒvj.
Tincture Belladonnæ - - - - - ʒviiij.
Olei Neroli - - - - - q.s.

Misce. Fiat lotio.

This may be used for bathing, for washing over, or for a compress.

Martin gives another prescription for the same purpose:—

℞ Boracis,
 Acidi Salicylici - - - - - ana ʒss.
 Acidi Borici - - - - - ʒi.
 Glycerini,
 Spiritus Vini Rectificati - - - - - ana ʒij.

Misce. Fiat lotio.

The hands to be bathed two or three times a day.

TREATMENT OF ALOPECIA.

This subject was selected by Brocq, for a recent clinical lecture, as being one for which medical men are very often consulted. It is, therefore, well to have full knowledge of the technique of the treatment of such cases, because, upon the way in which the applications are used, the success of the treatment often depends. Before prescribing any of the different applications, there is one point which should be, but is not, as a rule, sufficiently taken into account. It is the state of the scalp, whether dry or greasy. A very simple way to settle the point is to apply a piece of tissue-paper to the skin. If the skin is dry, the paper is not affected; if there is any greasiness the paper gets soiled more or less quickly. To prevent mistakes from the presence of pomade in the hair, this test should not be applied until two or three days after the head has been well washed with soap. Washing the head is especially useful in seborrhœa. For the purpose may be used decoction of soapwort, Ranama soap, or bran-water in which have been beaten up some yolks of egg, two or three to the half-litre. The last is a very good preparation for cleaning a child's scalp. A little borate of soda may be added to any of the liquids used. If it is likely that the hair, after washing, may become too dry, some oil must be applied, not at the roots, but at the ends. Too frequent washing is one of the chief causes of that particular condition of the hair when the ends are split, trichophytosis, as it is called.

Petroleum-ether is much used, and is of great service in well-marked cases. The handling of this substance requires a particular technique, and Brocq strongly insists upon the precautions which must be taken. It is so inflammable that it is very dangerous to use. It can take fire at a distance of 2 or 3 metres from a flame. Hair which has been saturated with it remains inflammable for some length of time. To use it, all that is necessary is to place some in a saucer, and, by means of a piece of wool, to apply it to the scalp by parting the hair and avoiding soaking the hair itself. It is extremely useful in very intense cases of seborrhœa, and, even in baldness due to this cause, it is possible, by alternative friction with petroleum-ether, and strong solution of formol, to arrive at a downy growth, and, in some cases, a full growth of hair, at the end of three or four months' treatment upon a cranium quite devoid of hair. It is only in the case of seborrhœa that washing the head and rubbing with petroleum-ether are useful. If the scalp is dry, they will provoke irritation, and even eczematous lesions. The growth of hair in the dry scalp must be promoted by the use of stimulating lotions, such as:—

℞ Tincturæ Jaborandi - - - - - ʒi.
 Tincturæ Cantharidis - - - - - ʒi.
 Linimenti Saponis - - - - - ad ʒvj.

Misce. Fiat lotio.

"To be well shaken together before use."

Or, ℞ Quininæ Hydrochloridi - - - gr. xv.
 Pilocarpinæ Hydrochloridi - - - gr. iv.
 Spiritus Vini Rectificati,
 Aq. - - - ana ʒiij.

Misce. Fiat lotio.

The reputation of pilocarpine, as a matter of fact, is much over-rated but it is such an established favourite with the laity that it is difficult to give it the go-by. It is well to bear in mind that it is a very costly production.

For the treatment of pityriasis of the scalp, in spite of the large number of remedies recommended, one of the three methods following must be adhered to.

Washing the head with a lotion consisting of 30 to 100 drops of liquid polysulphide of potash in half-a-tumblerful of hot water. Ten drops are enough to begin with, and the amount is increased each day until the limit of tolerance for the part of the scalp is reached. This is shown by a certain feeling of smarting when the lotion is applied. The applications are then to be continued with a dose just below this amount.

Coal-tar *saponiné* may be used to as large an amount as can be borne—about two tablespoonfuls of coal-tar to a tumblerful of water.

Lastly, lotions containing ammonia may be used.

℞ Liquoris Ammoniacæ - - - ʒi-ij.
 Spiritus Vini Rectificati,
 Aq. - - - ana ʒiij.

Misce. Fiat lotio.

A lotion, containing $\frac{1}{2}$ to 1 per cent. of resorcin with a little spirit, will be useful in some cases.

These lotions should be applied with a soft tooth-brush, or small pieces of absorbent wool. If the scalp is too dry, a pomade must be used from time to time. Brocq usually orders a 10 per cent. sulphur ointment, or this prescription:—

℞ Sulphuris Præcipitati - - - gr. xxx.
 Picis Liquidæ - - - ʒss
 Resorcini - - - gr. iv.
 Balsami Peruviani - - - ℥x.
 Paraffin mollis - - - ʒv.

Misce. Fiat unguentum.

Vidal's pomade may also be used:—

℞ Sulphuris Præcipitati - - - ʒiss.
 Olei Theobromatis - - - ʒiiss.
 Olei Ricini - - - ʒij.
 Balsami Peruviani vel Tincturæ Benzoini Compositæ - - - q.s.

Misce. Fiat unguentum.

The pomade is applied at night, and removed the following morning by washing with soap and hot water. A little oil of sweet almonds is then applied to the ends of the hairs.—(*Journal de Médecine et de Chirurgie prat.*)

THE TREATMENT OF ECLAMPSIA AT LA MATERNITÉ.

In his thesis, Carbonnel gives a detailed account of the treatment of puerperal eclampsia as carried out under Maygrier. The method, which does not recommend itself to all obstetricians, is based upon three main

considerations:—

1. The patient is intoxicated, and the obvious need is to find a remedy which, without harm to the patient, will enable her to rid her organism of a large amount of the toxic agent.

2. Arterial tension is very greatly increased. This may give rise to grave symptoms, so that it is necessary to reduce tension.

3. The kidneys are acting badly or not at all. The renal secretion must be re-established, or, as Pousson puts it, the stop-cock of the urine must be opened.

With this end in view, bleeding is employed methodically and copiously to 36 ounces, or even more.

As soon after admission into La Maternité as the patient is recognised to be suffering from eclampsia, she is bled systematically, the amount depending upon the corpulence of the patient, and her condition on admission, but specially upon the arterial blood-pressure as shown by the sphygmomanometer. The attempt is made to obtain a fall of 10–12 cm. in the column of mercury, and, in order to obtain this result, 800 to 1,300 cc. of blood at least must be withdrawn, provided that there has not been great loss of blood during labour. The bleeding is made slowly, twenty minutes to half an hour being occupied. If the pressure goes up again to 18 or 19, the bleeding is repeated before or after the appearance of fresh symptoms.

After the bleeding the patient drinks, or is given, by an œsophageal tube, some purgative water, such as two glasses of Seidlitz water. Then a copious intestinal lavage is carried out, using a long rectal tube, and 20 to 30 litres (35 to 50 pints). As a rule, this injection brings away but very little fœcal matter. Lumbar puncture is not indispensable, but should be employed in cases in which the headache is very intense, and the fits subinfrant. Finally, the patient drinks, or is given, about 7 ounces of water containing sugar of milk. She is made to pass water, or a catheter is passed, every two or every four hours regularly. The progress of the diuresis is thus kept under observation.

Between the fits, and in order to ward off their return, every source of peripheral stimulus and irritation is removed as far as possible from the patient, light is shaded, noise kept out, and vaginal examinations are reduced to minimum. These cannot be given up entirely, because in eclamptics delivery may take place almost unexpectedly. The patients are kept for two days upon the water or sugar of milk, and then are given dechloridized diet.

The basis of the treatment, therefore, is bleeding, but it is a "free and generous" bleeding, as advised by Porak and Mace. Observations show that the arterial tension diminishes to a lasting extent, that diuresis is established, and that convulsions cease very quickly. In many cases, the fits do not return, but in others they do, in which case a bleeding of from 12 to 18 ounces is necessary to finally suppress them. It is also to be remarked that complete convalescence is obtained as quickly as in cases in which delivery has been expected, and that the stay in hospital is no longer.

Out of 37 cases, admitted during 3 years, only 1 proved fatal; a mortality of 2·7 per cent. Statistics showed that, with bleedings of 16 to 18 ounces, or repeated bleedings of smaller amounts, the mortality is 30–33 per cent.—(*Journal de Médecine et de Chirurgie prat.*)

Reviews of Books.

Operations on the Ear: The Operations for Suppurative Otitis Media and its Intracranial Complications. By B. HEINE, Professor of Otology in the University and Director of the Otological Clinic in Königsberg, Prussia. Translated and edited from the Second German Edition by W. L. MURPHY, M.A., M.B., B.C., F.R.C.S.I., Surgeon to the Throat and Nose Department, St. Vincent's Hospital, Dublin. Pp. xvi+204. 58 Illustrations. London: Baillière, Tindall & Cox. 8s. 6d. net.

THIS is essentially a German book, written by Heine, and based upon his experience in Lucæ's clinic; all the authorities quoted, with the exception of Wilde and McEwen, are German. The operations described and recommended are those concerned only with middle-ear suppuration and its intracranial complications.

In discussing *paracentesis*, Heine rightly objects to the opinions expressed by Zaufal and Piffel that cases of middle-ear inflammation run a cyclic course, and that paracentesis should be avoided in consequence. We cannot, however, agree with the horizontal incision advocated, a vertical one is easier to perform, is more efficient, and avoids the pitfalls to which the author gives such prominence. We are surprised that the use of a mirror held by the teeth is advised.

In discussing the removal of granulations, it is stated that the word "polypus" should be used only when the growth is covered by epithelium; Brühl (whose work is quoted) has shown that all aural polypi are first granulation tumours, and that the presence or absence of an epithelial covering is rather accidental than a true histological distinction. Out of 47 granulations examined by Brühl, 21 had an epithelial covering and 26 had not. Heine prefers to use a snare, which he says is nowadays "universally employed," an assertion with which we cannot agree.

As regards ossiculectomy, the author states that, of late years, he has lost faith in its value.

Chapters II., III., and IV. deal with mastoid operations. The treatment of acute mastoiditis by Bier's method is well discussed and its dangers adequately pointed out, the author appears, however, to be favourably inclined towards it. For operating, the chisel and mallet are alone advocated, and the author does not seem to have any knowledge of the superior merits of the hand-gouge, as he makes no mention of it. Indeed, all British work—some of which is of great value—is ignored. As an instance, a knowledge of Hugh E. Jones' work upon the facial nerve might well have obviated much of the discussion on page 86. Heine advises the use of the remains of the tympanic membrane for closing the ostium of the Eustachian tube, and we note with approval that he does not agree with the grafting operation, and it is noteworthy that Ballance's efforts to make this method (entirely German in its origin) known in England are not mentioned. British work upon labyrinthine suppuration is also ignored.

Part II. is occupied with operations for intracranial complications, and deals with extradural abscess, sinus thrombosis, cerebral abscess, and meningitis. Space is devoted to adequate discussion upon ligation of

the jugular vein.

We have nothing but praise for the translator's labours, but the essentially German character of the book makes it necessarily narrow-minded and limited. It may, however, have some vogue with those worshippers of German surgery, whose attitude too often suggests a depreciation of all work done in other countries.

NOTES ON NEW EDITIONS.

A Handbook of Sanitary Law, for the Use of Candidates for Public Health Qualifications. By B. BURNET HAM, D.P.H. (Camb.), M.D., M.R.C.S., Commissioner of Public Health, Queensland. 2s. 6d. net.

THE activity of the Legislature in public health matters, during the year 1907, as expressed in the Public Health Acts Amendment Act, the Notification of Births Act, the Butter and Margarine Act, the Vaccination Act, and the Education (Administrative) Provisions Act, and in several Orders, such as the Home Work Order, have rendered imperative the appearance of new editions of all books dealing with Sanitary Law. The little work before us is the first to appear to fulfil this requirement, and a summary of all these Acts is contained in it. In this edition, too, the various Acts, relating solely to the public health of the metropolis, have been made more comprehensive, and the statutory enactments regulating the administration of midwives and the immigration of aliens, have also been added. An appendix sets forth the duties of a medical officer of health. The book is a veritable *multum-in-parvo* of Sanitary Law, well up to date, and can be warmly recommended to those for whom it is intended.

A System of Medicine by many Writers. Edited by Sir CLIFFORD ALLBUTT, K.C.B., M.A., M.D., LL.D., D.Sc., F.R.C.P., F.R.S., Regius Professor of Physic in the University of Cambridge, Fellow of Gonville and Caius College, and HUMPHRY DAVY ROLLESTON, M.A., M.D., F.R.C.P., Senior Physician, St. George's Hospital; Physician to the Victoria Hospital for Children; sometime Fellow of St. John's College, Cambridge. London: Macmillan & Co., Ltd. 25s. net each volume.

WHAT was previously the fourth volume of the *System of Medicine* has now been divided into two portions.

Part I. of Volume IV. contains an account of the diseases of the Liver, Pancreas, Ductless Glands, and Kidney, and in these sections we note very considerable changes.

The anatomy of the liver is admirably dealt with by Dr. Keith. Dr. H. P. Hawkins has rewritten his excellent article on Portal Cirrhosis, and Dr. Morley Fletcher contributes a new article on Biliary Cirrhosis. Tuberculosis of the Liver is dealt with by Dr. Hale White, and Dr. H. P. Hawkins takes up the subject of Syphilitic Affections of the Liver. Drs. Bosanquet and Newton Pitt write on Diseases of the Pancreas. There is an excellent article on Oedema by Professor W. D. Halliburton. Professor J. Rose Bradford contributes a new and most important article on Nephritis.

Part II. of Volume IV. deals exhaustively with the Diseases of the Nose, Pharynx, Larynx, and Ear. We congratulate the Editors upon issuing a volume devoted to the consideration of these regions, which are so closely related to one another, for it practically forms a complete handbook of these subjects. Dr. McBride has supervised this volume. Mr. Waggett has written

entirely new and excellent articles on Direct Laryngoscopy, Tracheoscopy, Œsophagoscopy, and Gastroscopy.

Diseases of the trachea are especially well dealt with by Sir Felix Semon and Dr. Watson Williams. These two volumes certainly maintain the high standard hitherto reached by those of the system which have previously appeared.

Clinical Methods. A Guide to the Practical Study of Medicine. By ROBERT HUTCHISON, M.D., F.R.C.P., and HARRY RAINEY, M.D., F.R.C.P. Ed. Pp. 632, with 11 coloured plates and 148 figures in text. London: Cassell & Co., Ltd. 10s. 6d.

WE are glad to see another edition of this book, which is already well known and appreciated. The chapters on the Alimentary System, the Blood, the Urine, the Nervous System, and Clinical Bacteriology are specially mentioned as having received attention in the preparation of this fourth edition. We are afraid, however, that the chapter on the chemical examination of the urine follows too much the usual lines in clinical works, and we should like to see it even more up to date than it is. With reference to page 341, we certainly think that one drop of nitric acid, added to one inch of urine in an ordinary test tube, would be quite sufficient to dissolve more than traces of albumin. We do not see any mention of the very excellent way of estimating sugar, associated with the name of Bang, a method which is rapidly replacing both Fehling's and Pavy's methods, nor do we see any mention of nitro-prusside test for Acetone. The actual details of the examination of patients and the accompanying illustrations are excellent, and we are sure that the book will continue to be in demand as one of the best of the smaller works on the subject.

Diseases of the Rectum, Anus, and Sigmoid Colon. By F. SWINFORD EDWARDS, F.R.C.S., Senior Surgeon to St. Mark's Hospital for Fistula, &c., Surgeon to the West London Hospital, and Senior Surgeon to St. Peter's Hospital for Urinary Diseases. London: J. & A. Churchill. 10s. 6d. net.

THIS book is the third edition of Cooper and Edwards' *Diseases of the Rectum and Anus*. Sixteen years have elapsed since the previous addition was published, and during this period the surgery of this part of the alimentary tract has made great advances both in methods of diagnosis and treatment. Consequently the whole book has been revised, enlarged, and largely re-written. New chapters have been added on the use of the sigmoidoscope and the operative treatment of malignant diseases of the rectum and anus. Modern operations, such as sigmoidopexy and appendicostomy, are described, a very brief account of the latter operation being given, though the author strongly recommends it in certain inflammatory diseases of the colon, which do not yield to lavage from the rectum, and apparently he does not consider it an universal panacea for so many abdominal conditions as some other surgeons do. Some of the older operations, such as lumbar colotomy, have been omitted. As it was formerly done, this omission is probably right and proper, but we think some mention might have been made of the modern operation, which is known under the same name. Cases illustrating the particular disease under discussion are numerous, and add to the value of the book, though the fact that such and such a case "was seen in consultation with Dr. So-

and-So," or "was sent to me by Dr. So-and-So," or was examined or operated on "in the presence of some other doctor or surgeon," is quite unnecessary. It is a method which is becoming more and more prevalent in reporting cases, and is not at all desirable, or even essential, especially when a book purports to be the record, and that a long one, of the author's own experience. There are many useful suggestions as to treatment, especially in the minor, yet very troublesome, complaints associated with this region, and we can recommend the book, which is well illustrated, as a trustworthy guide to the practitioner.

Physiology and Pathology of the Urine. By J. DIXON MANN, M.D., F.R.C.P., Physician to the Salford Royal Hospital; Professor of Forensic Medicine in the University of Manchester. With illustrations. Second Edition. Revised and enlarged. Pp. 324. London: Charles Griffin & Co., Ltd.

THIS is the second edition of a work, which appeared for the first time in 1904. In it Dr. Dixon Mann gives us a compilation on Urinalysis, which is at once complete, concise, and absolutely up to date, and yet withal is easy reading. All the usually employed methods of clinical observation are fully described in detail, and, in addition, many of the more elaborate procedures of research-investigation find a place in the volume. The urinary constituents are discussed separately, the amount of space devoted to each of them being proportionate to its importance. Under each is given its various properties, reactions, tests, methods of estimation, its variations under pathological conditions, and, in order that a due appreciation of its significance may be obtained, a concise account of its physiological metabolism, making the book excellent for purposes of reference. Moreover, original papers are cited and their sources indicated. An extremely interesting section is that devoted to "The Special Characteristics of the Urine" which deals with such questions as its Reducing and Oxidative Powers, its various Enzymes, toxicity, Kryoscopy, and Calorimetry. The book can be thoroughly recommended.

Forensic Medicine and Toxicology. By J. DIXON MANN, M.D., F.R.C.P., Professor of Forensic Medicine and Toxicology in the University of Manchester; Physician to the Salford Royal Hospital. Fourth edition, enlarged and revised. Pp. 709. London: Charles Griffin & Co. 21s.

DR. NIXON MANN's work is already well known, and we are pleased to see that it is being kept well up to date, as shown by the appearance of the fourth edition. The whole book has been revised, but special attention has been given to the section of Toxicology. This part is more fully dealt with than in any previous edition, and in addition to complete revision of the old subject-matter, many new poisons have been added, so that, on the whole, this part is the best in the book. This section comprises about 300 pages, and, coming from the pen of an authority on the subject like Dr. Nixon Mann, makes it of great value for reference. This book has been in the past largely used by medical students, and chiefly by those studying for the higher degrees. It is always a difficult matter to keep a book of this sort within reasonable compass so as to appeal as well to the student going in for the less severe examinations; but, even to this latter class, it will be a useful work to refer to after their lectures on the subject. To the practitioner, the book will be more useful than ever, as it is larger and more up to date.

Practical Guide to the Diseases of the Throat, Nose, and Ear for Senior Students and Junior Practitioners. By WM. LAMB. M.D., C.M., M.R.C.P., Honorary Surgeon to the Birmingham Ear and Throat Hospital. Pp. xvi + 322. 55 illustrations and 2 plates. London: Baillière, Tindall & Cox. 7s. 6d.

THIS is the second edition of the author's little guide, published in 1904, the title of which has been modified, and the scope expanded by the enlargement of the section on diagnosis and the addition of notes on treatment. For so small and compact a work it is remarkably exhaustive and complete. The author urges the beginner, at the outset, to cultivate a habit of exhaustive examination, and, were this more frequently insisted upon, we are of opinion that mistakes in diagnosis would be fewer. The general practitioner, who seems to be called upon nowadays to treat throat, nose, and ear conditions, cannot afford to make mistakes. Allusion is made to the connection between septic teeth and inflammatory conditions of the tonsil, a matter either ignored or passed over too lightly by the majority of text-books. The description of the adenoid operation, though short, is very adequate, and we fully agree with the opinion expressed as to the unsuitability of forceps in removing those growths and with the remark that the so-called "recurrence" of adenoids is "probably always due to imperfect operation." A very useful section is that on eye symptoms in nasal disease, and the article upon the examination of the nose is wholly excellent. That upon nasal treatment is also good, but the directions as to the employment of nasal washes might be made more explicit, and a warning added as to their special dangers. Removal of "posterior ends" by means of the snare, is described, but we have found the special turbinatome devised by Lake much more convenient and efficient. No mention is made of the formation of fresh inferior turbinals, by means of paraffin injections, in the treatment of atrophic rhinitis. We fully agree that "there is only one satisfactory operation on the septum, and that is the submucous resection," but, for several reasons, we prefer to perform it under general anæsthesia (in the sitting position) rather than under cocaine.

The chapters dealing with the larynx, and especially that on the "Influence of the Nose on the Larynx," are very adequate; the diagrams of laryngeal paralyses are helpful, but there is a mistake in the lettering of Fig. 34.

As regards the section on the ear, there are a few points to which objection may be taken. Luca's fork is far more trustworthy than Gardiner Brown's (which the author recommends), nor is the watch of any great value as a test for hearing. Weher's test, too, is (except in a few cases of unilateral deafness) quite valueless. Lastly, the employment of the signs + and - for positive and negative is to be deprecated. In discussing treatment, the futility of allowing patients to syringe their own ears is not laid stress upon. We make these few remarks in a spirit of pure criticism, for the book is, in every other respect, an excellent one, and does not contain one single obscure passage. There are some useful selected formulæ at the end of the volume.



Notes by the Way.

A Medical Night
at the
Authors' Club.

THE Authors' Club includes many medical members ; so that, when Sir Almroth Wright was recently entertained there, at a dinner at which Dr. Tom Robinson took the chair, and expounded the principles of therapeutic inoculation, his audience was by no means exclusively composed of laymen, but also comprised many men of note in the medical world. Dr. R. W. Allen spoke, and so did the Chairman, and Dr. Brudenell Carter ; while Lord Justice Fletcher Moulton helped to make technicalities comprehensible to the least scientific intelligence by a lucid and well sustained analogy between the invasion of the human body by pathogenic organisms, and an assumed invasion of Britain by a foreign foe. A summary of the debate, however bald, would require more space than we have at our disposal ; but both the enthusiasts and the sceptics were brilliantly represented. Caution is perhaps the word which best describes Dr. Tom Robinson's attitude towards the claims of the new school ; but Dr. Brudenell Carter spoke with the gratitude of a patient, who had found the treatment a specific for catarrh, and felt that he need fear no foe of that sort in the future, provided that he kept a certain "sauce" where Mrs. Gamp used to keep her favourite restorative, and employed it, when "so disposed," for the rectification of his opsonic index. We all, without exception, hope that his expectations will be justified.

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Mouth Washes.

THE movement in favour of the establishment of school clinics for the examination and treatment of the teeth is gaining ground. The report of an experiment in this direction undertaken, with private assistance, by the Cambridge Borough Council, shows at once the need for such clinics and the good results which they can accomplish. Dental caries, however, as we have often pointed out, is only one of many evils which result from

inattention to the hygiene of the mouth. It is in the mouth, so to put it, that microbes throw up their first parallels for their siege of the human system ; and it is, therefore, in the mouth that they should first be dealt with and destroyed. That is obvious ; and the consideration brings us to the question of mouth washes, in connection with which the average man encounters practical difficulties. Good mouth washes are worth much, and cost little to prepare. Most of those in general use, however, are proprietary articles and cost a great deal to buy ; and the layman, as a rule, has no means of knowing how any given mouth wash will affect the mucous membrane, or what is its bactericidal strength. He can only judge it by the price and the flavour ; and the price of a good preparation is often, though it need not be, prohibitive. Three and sixpence for a bottle of which the value of the ingredients is fourpence is no uncommon discrepancy ; and no one can expect, say, a struggling clerk with a large family to give that family the run of a three-and-sixpenny dentifrice. He is far more likely—and it is difficult to blame him—to confine them to precipitated chalk. Hence a great deal of the indigestion which abounds, to say nothing of graver maladies. The case, it seems to us, is easily one with which the general practitioner can deal. He can write prescriptions for mouth washes as easily as for medicines ; and cases, in which it would be desirable to do so, must be continually coming under his notice. The principles which determine the effectiveness of mouth washes were expounded in an article in the May number of *THE PRACTITIONER* ; and it is quite certain that many of the well-advertised proprietary preparations do not conform to them, though their price is much higher than the chemist's reasonable charge for dispensing such a mixture as a doctor would order.

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The Dangers of X-rays.

A GREAT deal of alarm appears to have been excited by the reports published of the injuries suffered by doctors through their use of the X-ray apparatus. If the doctor cannot protect himself, it is asked, how can he protect his patient ? And is it not better to dispense with the facilities for diagnosis which the

rays afford than to take the risk of a dermatitis not easily distinguishable from cancer? The recent melancholy cases readily account for, and even to some extent justify, this nervousness; but the grounds for it are happily illusory. The real risks in the matter were taken by the pioneers, who did not know that they were taking risks, and consequently proceeded without adequate precautions. The nature and extent of the danger have now been determined, approximately if not completely, and effective precautions have been devised. The patient is safe from the fact that an exposure for fifteen minutes to rays of moderate intensity causes no damage whatsoever; and, even if damage does appear to result, prompt attention to the premonitory symptoms of redness and irritation quickly dispels the trouble. The doctor can protect himself by his masks, aprons, gloves, screens, and spectacles, which prevent the rays from penetrating in any desired direction. Whether the subject is as yet sufficiently explored to justify the compulsory application of the rays to children suffering from ringworm, as the London County Council proposes, is another question. Dr. Dawson Turner thinks not, and writes to the lay press to say so. We are inclined to agree, for ringworm, after all, can be cured, though the process is more tedious, in other ways. Incompetent operators might do the most serious harm; a great number of operators would be needed; and the absolute competence of all of them could not be guaranteed.



Practical Notes.

THE TREATMENT OF UNREDUCED OCCIPITO-POSTERIOR PRESENTATIONS.—There are two groups of cases in which the vertex presents with the occiput behind, namely, the *bregmato-cotyloid*, in which the bregma, or anterior fontanelle, lies opposite the acetabulum, and the *fronto-cotyloid*, in which the frontal eminence lies opposite the acetabulum. In the former group, the head is well flexed, so that the occiput, on meeting the resistance of the pelvic floor, takes the long internal rotation forwards through three-eighths of a circle, and comes to occupy an anterior position. Labour now proceeds normally. Luckily the majority of occipito-posterior presentations belong to this group.

In the latter group, the head is not well flexed, and either remains unrotated, or the occiput rotates backwards into the hollow of the sacrum. In this way an unreduced occipito-posterior or "face to pubes" delivery results, in which there is always great difficulty in the expulsion of the presenting part. This is due partly to the fact that the diameter, which is engaged in the antero-posterior diameter of the pelvic outlet, is the occipito-frontal, measuring four and a half inches, partly to the fact that the wide posterior part of the foetal skull distends the perinæum instead of emerging between the labia, and partly to the fact that a portion of the foetal trunk enters the pelvic cavity along with the head, thus over-distending the vagina. The forehead first passes out beneath the pubic symphysis, then the occiput slips over the stretched perinæum, and finally the face passes under the symphysis. Delivery of the head is thus effected by a movement of extension, and, unless the child is very small, a severe rupture of the perinæum is extremely prone to occur.

The main object in the treatment in occipito-posterior position is to change them into the occipito-anterior. This can easily be done in a multipara before the onset of labour, and before rupture of the membranes when the head is not engaged in the pelvis. Abdominal palpation will reveal the position of

the child, and gentle manipulation with the two hands will suffice to correct it, the anterior shoulder being pushed forwards with one hand, and the posterior shoulder pushed backwards with the other, until the back is brought to front, when the labour may be left to take its natural course.

When, however, the case is not seen, or the diagnosis has not been made until the head has become engaged in the pelvis, this simple manœuvre is no longer applicable. Labour must now be allowed to proceed. The os becomes fully dilated, and the membranes rupture, and the head descends on to the pelvic floor. It is in this position, on account of meeting with the resistance of the pelvic floor, that the forward rotation usually occurs. Several hours, and even longer, if the pains are feeble and infrequent, should be waited after full dilatation of the os to allow the head to rotate naturally. If it neither rotates nor advances, the condition becomes one of persistent or unreduced occipito-posterior presentation. In this condition, three courses are open to the obstetrician, namely, (1) to flex, (2) to rotate, and (3) to pull.

Since the non-rotation forwards is due to diminished flexion, it is probable that, if the head were fully flexed, spontaneous rotation might occur, or rotation could more easily be accomplished by manipulation. Flexion may be produced, either by pushing up the sinciput with the fingers, or by pulling down the occiput, during the pains, by means of the vectis. Having promoted flexion of the head, rotation may now be accomplished. For this purpose, an anæsthetic is administered, and the patient placed on her back. The right hand is inserted into the vagina and grasps the head, which is then rotated so as to bring the occiput forward. At the same time an assistant (usually the nurse in attendance) places the two hands on the patient's abdomen, and pushes backwards the posterior shoulder with one hand, and pulls forward the anterior shoulder with the other hand. The rotation of the head and body are thus made simultaneously, and there is no tendency for the occiput to slip back, which is bound to occur if rotation of the head alone with the hand in the vagina is attempted. Flexion and rotation having thus been accomplished, the case has been converted into a normal

occipito-anterior presentation, and may now be allowed to proceed naturally. As, however, labour has already been somewhat prolonged, and as the patient, at this stage, is under an anæsthetic, it is good practice to apply forceps, and complete delivery without further delay.

VAGINAL TAMPONS.—Vaginal tampons or plugs are applications consisting of cotton-wool, sterilised gauze, or lint, either medicated or plain, which are introduced in the vagina with a view of checking hæmorrhage, relieving inflammation, or supporting the uterus and ovaries.

For checking hæmorrhage, as in cases of abortion, and in the after-treatment of operations, strips of iodoform or sterilised gauze, two inches wide and a yard long, are introduced with long dressing forceps through a Fergusson's speculum, first into the vaginal fornices, and then into the vaginal canal from above downwards, gradually withdrawing the speculum while so doing. An alternative method is to take pledgets or balls of gauze, and tie them together in series with strong silk, so as to form a kite-tail plug, which is introduced in a similar manner. The plug should be withdrawn in 24 hours, and a vaginal douche given. If the hæmorrhage has not ceased by this time, the plugging may be repeated.

For relieving inflammatory and congestive states of the uterus and its appendages, and in vaginitis, soothing and deobstruent tampons are indicated. These are composed of cotton-wool soaked in glycerine, or in ichthyol and glycerine, until thoroughly moist, which is then shaped into balls about the size of a hen's egg, and tied with silk, the end of which is left long. One of these is introduced either directly with the fingers, or through a speculum into the posterior vaginal fornix, the end of the silk thread being placed just within the vaginal orifice. It should be worn for 24 hours, when the patient removes it by pulling on the silk thread; a hot vaginal douche of boric lotion should then be given. This treatment can be continued with advantage for several weeks, until the disappearance of the inflammatory symptoms. It may be well to warn the patient that there may be some vaginal discharge whilst wearing the tampon.

The supporting plug is occasionally used in cases of prolapse

of the uterus or ovaries, and in retroversion, either to maintain the displaced organs themselves, or pessaries, in position. It is composed of cotton-wool or marine lint, and is packed into the vagina through a speculum. It must be renewed every third day.

FACIAL PALSY IN THE NEW BORN.—Facial hemiplegia is not uncommonly observed in new-born infants, especially in cases of forceps deliveries. It results, as a rule, from compression of the facial nerve in the parotid region by the blade of the forceps, when faultily applied. The resulting deformity is characteristic; it is usually unilateral and transitory, but may be bilateral and permanent.

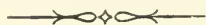
Treatment is seldom required, and recovery may be expected, usually within a week. When this fails, local applications of the faradic current should be regularly made, and when this is necessary a guarded prognosis should be given, as more or less permanent deformity may result.

GUAIACUM IN DYSMENORRHŒA.—The administration of drugs in the treatment of dysmenorrhœa may be employed either to prevent the occurrence of pain at the menstrual periods, or to palliate or relieve the pain when it has arrived. Analgesics of the coal-tar series, such as phenacetin and antipyrin, are largely employed as palliatives, and often with marked success. For the cure of dysmenorrhœa, however, Dr. Herman very strongly recommends guaiacum resin, which he states will, in some cases, prevent the pain from coming on, or lessen its severity when it does come. Ten grains should be administered three times a day, begun a week before menstruation is expected, and continued until the time, at which the pain usually occurs, is past. It may be given in cachets, mixed with gum tragacanth or malt extract, or in the following mixture :—

R.	Guaiaci Resini	-	-	-	-	gr. x.
	Mucilaginis	-	-	-	-	q.s.
	Aq. Chlorof.	-	-	-	ad	℥j.
Misce. Fiat mist. Ter die sumend.						

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